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EXPERIMENT STATION RECORD

VOLUME XXVIII, 1913

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EXPERIMENT STATION RECORD.

VOL. XXVIII. JANUARY, 1913. No. 1.

One of the notable signs of progress in our agricultural institutions is found in the agricultural library. Those who have not seen the chaotic condition, the lack of attention, and the prodigal waste which characterized many of the libraries a few short years ago can hardly realize what a change has taken place. It marks a very important transition for the student, the teacher, and the investigator; and it has made the college a center of knowledge in a new and larger sense.

Not only is the vast amount of material that can be had for the asking now being collected and bound and cared for very generally, but new treatises are selected with greater discretion, the sources of information are being catalogued, and the attempt made to make the most of the facilities at hand or near by. The library has taken on new life and interest as an essential part of the working equipment. The attitude toward it has changed. Instead of being a collection of books which are shelved and unknown except to the few, it is being vitalized by modern methods of management and brought into larger usefulness by making its store of knowledge readily accessible. Students are taught to use books, and investigators and teachers are provided to some degree with bibliographic help.

The importance of the proper organization and management of the libraries of our agricultural colleges and experiment stations led to the consideration of this matter at the last convention of the Association of American Agricultural Colleges and Experiment Stations, in two separate reports. These were presented by the bibliographer, Dr. A. C. True, and by the committee on station organization and policy. The former dealt with the opportunities for cooperation among institutions to render their libraries more efficient in meeting the needs of their constituents, and the latter treated more specifically of the organization and function of the experiment station library.

In very many instances the experiment station has been the inciting cause which has led to more adequate attention to the library. The need was especially emphasized there. It was early apparent that the library lies at the very heart of the experiment station work as soon as that work develops into original lines and embraces real

research features. Books and periodicals become quite as essential as apparatus and other facilities, and the need for these develops with every new line of investigation.

Hence many of the stations, finding only meager collections in the college and little care given to them, early began building up libraries of their own, later making provision for their care and for some bibliographic assistance. This example and the growing needs of the college quickened interest in the college library, and has led to special provision for it. At nearly every agricultural college, whether separate or associated with a university, the library is now receiving considerable attention in the way of funds and of intelligent treatment, and becoming a strong and efficient department of the institution. Hence the college library is in far better position to aid the experiment station than it was formerly, and the argument for a separate station library has lost much of its force. A union of the two will usually serve to supplement the resources without undue duplication, and better meet the requirements of both the station and the college men.

The station workers are now rarely housed in a single building, but are often scattered as widely as the college departments. A scattering of the library through various offices in remotely located buildings, as is often the case, adds to the inconvenience and annoyance of the workers as a whole and defeats the central idea of a library.

It should, of course, be recognized in any efficient library management that certain handbooks and treatises are used almost constantly for reference, and should be deposited in the departments where most needed, even to the extent of duplicating copies in the library if necessary. But the natural tendency of most men is to accumulate larger and larger numbers of books in their departments, and this tendency often needs to be checked to maintain the department libraries within bounds. The largest convenience of all the staff must be the object aimed at; and because books are near at hand it does not necessarily follow that they are more accessible. The important matter to the investigator is to be able to get the material he wants when he wants it; and the place where the books are shelved is of less importance, provided it is readily accessible, than that there should be a competent person to look after them and render bibliographic assistance.

As the mission of the station library is to serve its investigators and scientific workers, it is from its nature mainly a reference collection of technical books and pamphlets. It should therefore be selected with discretion, and not with a view to building up a general agricultural library. The responsibility of providing such a general agricultural library may properly be left to the college or uni-

versity with which the station is connected. The station has neither means nor facilities for providing and caring for such a general collection, which it needs only occasionally.

But even in this restricted field it is not reasonable to expect that the stations, with the increasing amount and diversity of their investigations, can develop library facilities adequate to their needs. Their workers will employ all the facilities on the grounds, and will then need help in procuring loans from other institutions. The station's contribution to the library resources of an institution will at best be relatively small.

These considerations led the committee on station organization and policy to the conclusion that in an institution of limited funds the interests of the station and the college can best be served by combining forces and resources in one strong library. Such a combination husbands the resources and insures better management and library assistance. The committee recommended therefore that "as a general proposition the station library should be organized as a part of the main library of the college or university, in the sense of being subject to the same general management, and being catalogued with the main library in order to show fully the resources of that library. . . .

"Where the college or university library is conveniently accessible to the station workers there is much to be said in favor of having the station's collections deposited in the college library, in a separate reference and reading room for the station staff, with an assistant in charge. On the other hand, where the college of agriculture and the experiment station are located at an inconvenient distance from the university library, a separation of the agricultural library seems desirable. In such case the station collections should be maintained strictly for reference purposes and the college collection used for circulation."

Both of these plans would preserve the station's collections intact and available to its men for consultation or loan. They would likewise provide trained assistance in looking up references and securing books from the outside, as well as for the general upkeep of the collection.

The report of the bibliographer of the association pointed out the almost utter lack of cooperation and coordination among the libraries of the agricultural colleges and experiment stations. As a result we have a group of more than fifty libraries interested in identical lines of literature, striving independently with more or less zeal to collect and file publications of similar character, each ignorant of the resources of the others and too frequently ignorant of all resources apart from it own meager collection of books, periodicals, and official documents.

The final purpose of the librarian has been described to be "to bring a book to a reader and to bring a reader to a book." But among the libraries of the state agricultural colleges and experiment stations few can hope to have a collection adequate to the needs of both the student and the investigator. The merest essentials in the way of scientific periodicals and books of reference tax the resources of most of them, and for the highly specialized literature they must draw upon other collections as needed. At present this is done chiefly by appeal to the government libraries at Washington, all of which respond liberally to requests for interlibrary loans. In this respect the Library of the Department of Agriculture is the chief source of aid to the smaller institutions. As a national agricultural library, it has aimed to extend its services as far as possible to the investigators in agricultural science throughout the country. The relations of the Department with the land-grant colleges and experiment stations are such as to especially commend this course.

The Department Library at the present time probably contains the largest collection of literature on agriculture and related sciences in this or any other country. But it is doubtful whether its facilities are fully known to the librarians of the land-grant institutions. At present its collections number one hundred and twenty-two thousand books and pamphlets. Its accessions numbered over nine thousand last year. It is especially strong in scientific and technical periodicals and society publications. Nearly two thousand periodicals are received currently. Its dictionary card catalogue contains approximately two hundred and eighty-six thousand cards, and is an invaluable key to the literature of agriculture and the related sciences.

The extent of its loans to the agricultural college and experiment station workers has steadily increased from an occasional book a few years ago to six hundred and twenty books the past year. These went to persons in thirty-nine different States and Territories, ranging from Maine to Hawaii and from Oregon to Florida and Porto Rico. With a wider knowledge of the Department Library's facilities and practice of loans it is believed that it might perform to an even larger extent the duties of a national library of agriculture, to the material advantage of experiment station investigators.

To borrow from a library at a distance is a comparatively simple matter when accurate information is at hand concerning the book desired. In case of an obscure, insufficient, or inaccurate reference, however, it is often difficult in the absence of extensive bibliographic aids to identify the publication definitely enough to warrant a formal request. Frequently the verification of a reference is desired, or other information for which the transportation of a volume would not be necessary except for the fact that the lending library can not reasonably be asked to work upon meager data, or to take the time to trace a statement to its source.

Furthermore, the librarian who deals to any extent with official literature oftentimes finds himself lacking, on the one hand, some necessary volume and on the other possessed of a number of duplicates which he lacks space to file and time to arrange, but which are too valuable to be thrown away. Documents from the Federal Government can be sent back to Washington under frank, but state documents, reports of institutions, foreign and domestic, odd numbers of periodicals, reprints, and the like, are a veritable burden and their disposition an unsolved problem.

No small library can hope by its unaided efforts to establish a system of exchange by which its duplicate material may be made to contribute to its resources, inasmuch as the labor of operating such a system and the cost of transportation would exceed the value of the publications acquired. The task would seem one that could best be performed through the cooperation of a group of closely related libraries whose scope and purpose are similar.

The Library of this Department has from time to time distributed lists of its duplicates to the libraries of the state colleges and experiment stations, and has furnished these duplicates where desired without demanding an equivalent. The extent to which this duplicate exchange service and the lending of books are utilized leads to the belief "that this work might be organized advantageously on a wider basis and operated on a larger scale under more extensive cooperation on the part of the agricultural colleges and experiment stations."

The bibliographer's report suggested that the functions of the Department Library might be extended so that it could act as a central agency for the receipt and distribution of duplicates among the libraries of the agricultural colleges and experiment stations, and supplement their work by acting as a bureau of bibliographic information. "Such an agency would have access to all libraries in Washington for securing desired information and for the arranging of loans. For locating publications not available in Washington, the union catalogue of the Library of Congress would be of great assistance, since it represents a number of large libraries in different sections of the country. Selected reprints more convenient for transportation than large volumes would gradually accumulate and serve as the basis of a lending collection which would be supplemented by other collections in Washington and elsewhere. In case of bulky, rare, or much used publications, for which a loan could not be arranged, photographic reproductions of specified portions might be furnished."

The possibilities in this direction are large. Many of our station investigators are removed from large centers, and feel the isolation with special force in respect to the library facilities at

their command. Nearly every worker is conscious sooner or later of the inadequacy of the local collections, especially when the literature of a special subject is being looked up. Every investigator will realize how great a service might be rendered to his work by extending the necessarily limited facilities of the local libraries, and bringing to their disposal the most complete collections and catalogues in the country.

A highly important step has been taken in definitely recognizing the needs of the college libraries and placing them on a greatly improved basis. The next logical step is to extend their individual facilities through cooperation. This implies, for one thing, a more intimate relationship, the way for which has been opened by the formation of an agricultural section in the American Library Association. The Department Library is in position to extend its services in the direction of loaning books and furnishing a limited amount of bibliographic assistance. For it to provide the larger service and manage the various lines of cooperation suggested between libraries would require not only additional funds but larger quarters. It would, however, be a measure of economy, and would contribute in many ways to the larger efficiency of the comprehensive system of American agricultural institutions.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS, 1912.

The year 1912 marked the fiftieth anniversary of the birth of the agricultural college in this country under the Morrill Act, and of the National Department of Agriculture at Washington. It was also the twenty-fifth anniversary of the experiment station as a national institution. These facts very naturally made the 1912 meeting an anniversary convention, with special addresses commemorative of these important measures and of the institutions which have grown out of them.

These addresses were by Dr. A. C. True, of this Office, on The United States Department of Agriculture, 1862–1912; Dr. W. O. Thompson, of Ohio, on The Influence of the Morrill Act Upon American Higher Education; Dean Eugene Davenport, of Illinois, on The American Agricultural College; and Dr. H. C. White of Georgia, on The Experiment Stations.

The president's address, by Dr. W. E. Stone, of Indiana, was also largely historical, viewing the development of the land-grant institutions in relation to the theory and practice of education, and to other educational institutions, and dealing with some of the special problems and dangers which still confront these colleges. Dr. Stone appealed to the common interest of all the land-grant colleges in upholding the position of agricultural education and maintaining the integrity of their field, having due regard to the highest interests of the state.

These anniversary papers have been noted editorially in preceding issues. The association will have them published in advance of the proceedings for wider and more prompt circulation.

The report of the executive committee detailed its efforts in behalf of the Lever bill for agricultural extension, and the status of this bill at the close of the last session of Congress, and it emphasized the great importance to the colleges and stations at this juncture of securing the passage of the measure. Senator Hoke Smith of Georgia, who is sponsor for the measure in the Senate, addressed the convention and explained his plans and hopes for its passage. The association voted to memorialize Congress in behalf of this measure, and expressed its approval of a draft of such a memorial presented by the executive committee. Mr. H. H. Gross, of the National Soil Fertility League, addressed the convention by invitation, expressing the deep and active interest of the league in the passage of the extension bill.

The treasurer's report showed a balance of $3,414 on hand, in view of which the executive committee recommended that the annual dues be reduced to $35 for each college and $20 for each station, which was approved. The committee also called attention to the agricultural conferences arranged for by the International Committee on Agriculture at Ghent, Belgium, during the summer of 1913, and asked authority to designate a representative.

The report of the bibliographer, Dr. A. C. True, dealt with the lack of cooperation between librarians of the various colleges and experiment stations, and suggested some lines of cooperation which might be profitable. Among these

were the maintenance of an exchange for the disposal of duplicate state documents, reports of institutions, odd numbers of periodicals, etc.; a loan exchange; the verification of references, or supplying of information not requiring the loan of the book. (See also p. 3.)

The committee on instruction in agriculture reported, through Dr. A. C. True, on the work of the agricultural colleges in training teachers of agriculture for secondary schools, based on a study of catalogues and opinions collected through a circular letter. Among the committee's recommendations were that "teachers of agriculture in secondary schools should have not less than twenty semester hours of professional training, including instruction in educational psychology, history of education, pedagogy, and special methods applicable to agriculture in the secondary schools, supplemented by practice in teaching. . . . Definite provision should be made for practice teaching on the part of those preparing to teach agriculture. . . .

"Inasmuch as the supply of properly trained teachers of agriculture will continue below the demand for some time, the agricultural college should make special provision for training teachers already in high-school service who desire to fit themselves to become teachers of agriculture in secondary schools. In this work special emphasis should be laid on the acquirement of the subject matter of agriculture, including both the science and practice. Agricultural instruction of collegiate grade should be offered in summer sessions or through correspondence courses, and provision should be made for credit for this work on passing suitable examination."

The committee on graduate study gave an account of the fifth session of the Graduate School of Agriculture, held at Michigan Agricultural College, during July, 1912. The session of this school has been previously described in these pages (E. S. R., 27, p. 101).

The committee on experiment station organization and policy reported through Dean E. Davenport, advising against the association taking any action in regard to publishing the lists of projects conducted by the stations under the Adams fund, as the suggestion of the station section last year was found to have little approval and to meet considerable strong objection.

In regard to the organization of the station library, the committee recommended that while local conditions must necessarily be considered, as a general proposition the station library should be organized as a part of the main library of the college or university in the sense of being subject to the same general mangement and being catalogued with the main library in order to show fully the resources of that library. (See also p. 1.)

In regard to the distribution of station publications, the committee recommended (1) that station publications be sent free so far as facilities permit, giving preference to local applicants; (2) as an alternate that applicants be advised to have their names listed for the Monthly List of Station Publications issued by the Office of Experiment Stations; (3) that bulletins be classified by subjects, in the interest of their economy. The suggestion was made that foreign exchanges may be made through the Smithsonian Institution at a considerable saving.

A paper on Courses of Study in Agricultural Colleges, by Prof. F. S. Jenks of the U. S. Bureau of Education, gave an analysis of the courses of study at a considerable number of agricultural colleges as shown by their catalogues. This analysis brought out the great disparity in the amount of time spent on various subjects and the requirements for graduation. The paper precipitated discussion on the differentiation in instruction between men who are to be practitioners and those who are to become investigators, teachers, etc., and the requirements in preparing men for the latter line of activity.

Bearing directly on this subject was Prof. M. F. Miller's paper on The Proper Correlation of Practice Work and Scientific Work. Professor Miller thought there should be more differentiation between courses of study for practical and for technical men. The demand for practical men in the middle west has strongly affected the courses of study. In the collegiate courses the study should be scientific and technical, and graduate work was held to be the most feasible method for providing the practical features.

The great demand for men for investigation, teaching, and extension work was pointed out, and it was noted that as the colleges are not able to supply the demand for leaders many ill-fitted men are put into such positions. Training for extension work and also for teaching calls for intimate practical knowledge of farm affairs. This practical training can be secured outside the college. The practical work of the college should be restricted to such as can not be had elsewhere. When the time is restricted preference should be given to the technical and fundamental studies.

It was held that our courses should do ample justice to men preparing for both technical and practical careers, but it was pointed out that the schools of agriculture offer an opportunity to some extent as a training school for practical men. The difference in requirements for men of different training and ability should lead to differentiation in the college course.

Dean C. F. Curtiss suggested that the end in view might be reached by allowing for electives in the last two years to meet the special needs of the student. There is demand for graduate work for men who are preparing for technical lines of service. Good graduate work should, therefore, be offered by the colleges.

President E. A. Bryan emphasized the necessity of thorough training in the fundamental sciences regardless of whether the student is to be a technical or a practical man, to aid him in obtaining the scientific method of thought.

Dean H. C. Price described a combination which is being worked out at Ohio State University in a five-year course, taken in part in the college of arts and in part in the college of agriculture. This gives a better preparation. At the end of four years a degree can be taken from the arts course and in one year more the degree from the agricultural course.

Dr. W. H. Jordan urged the value of the fundamental sciences as the best training to teach men to think. He declared that "what a man needs on the farm is understanding," and that "it is the trend of mind that succeeds and not the man who is in possession of facts."

President K. L. Butterfield presented a report on the proposed American committee to study European credit systems in 1913. This movement started with the Southern Commercial Congress, the plan being to send two men from each State. The question was raised as to the part which the agricultural colleges might take in this inquiry. Correspondence showed that only about one-third of the college presidents favored an attempt to get state appropriations to defray the expense of two state delegates, one to be chosen from the agricultural college.

President Butterfield presented an argument for a thorough study of European methods, conducted by competent men, but questioned the desirability of so large a commission as was planned, and the convention declined to seek representation upon it. It, however, expressed its belief in the great importance of securing more liberal credit conditions for American farmers, and favored a thorough study by experts of rural credit systems of Europe and their adaptation to American conditions.

President R. A. Pearson submitted a plan for the selection of agricultural experts from this Department and the agricultural colleges and experiment

stations to be sent abroad to conduct studies of special problems or practices in the field of agriculture, such persons to be designated or approved by the association through its executive committee and commissioned by the Department. Reference was made to the large number of experts sent to this country by European governments to secure first-hand knowledge. The trips made abroad by our agricultural experts are largely of private character and are usually too hurried for anything like thorough study. This matter aroused considerable interest, and the plan received the approval of the convention.

On motion of President Butterfield the executive committee was instructed to elaborate a declaration of principles relating to the field and function of the colleges and stations, and their relations with other agencies, to be printed so that it may be discussed at the next convention.

A resolution by President J. H. Connell providing for a standing committee to investigate and report upon the educational efficiency of the land-grant colleges, in the light of the present and what remains to be done, was referred to the executive committee for report upon at the next meeting.

The association reaffirmed its declaration of last year in favor of federal aid for public schools of secondary grade providing for instruction in agriculture, home economics, and manual training, and for the education and professional training of teachers for these schools in the several States.

On motion of Director C. E. Thorne, the association passed resolutions of congratulation to Secretary James Wilson on his long and successful administration of the Department of Agriculture, and expressed the cordial good wishes of the convention. The appointment of a committee was authorized to wait upon President-elect Wilson and represent to him the interest of the association in the administration and work of the U. S. Department of Agriculture, and express its confident hope that under his administration the relation of the institutions with the Department may continue to be cordial and mutually helpful. The committee designated consists of Dr. W. O. Thompson of Ohio, Dr. W. H. S. Demarest of New Jersey, Dr. C. C. Thach of Alabama, Dean E. Davenport of Illinois, and Director C. D. Woods of Maine.

The convention expressed itself as in favor of providing a permanent official in the Department of Agriculture, to have charge of the scientific work and have the general function of advising in relation to coordination of the scientific and other activities, with a view to emphasizing the permanency of the work and policy of the Department.

Appropriate resolutions were adopted on the death of Dr. M. A. Scovell, a former president and long an active member of the association.

The thanks of the association were extended to Dr. H. E. Stockbridge for his assistance in making local arrangements for the convention and for the entertainment of its members.

The officers elected for the coming year were as follows: President, Dr. E. H. Jenkins of Connecticut; vice presidents, Dean E. Davenport of Illinois, President E. A. Bryan of Washington, President A. M. Soule of Georgia, Dean A. F. Woods of Minnesota, and Director J. F. Duggar of Alabama; secretary-treasurer, Dr. J. L. Hills of Vermont; bibliographer, Dr. A. C. True, Washington, D. C.; executive committee, Dr. W. O. Thompson of Ohio, Dr. D. H. Hill of North Carolina, Dr. E. E. Sparks of Pennsylvania, Dr. W. H. Jordan of New York, and Dr. H. L. Russell of Wisconsin.

Vacancies occurring in the committees were filled as follows: Committee on instruction in agriculture, Prof. J. F. Duggar and Prof. W. H. French; committee on graduate study, Dr. W. O. Thompson and Dr. Brown Ayres; committee on extension work, Prof. Alva Agee and Prof. C. W. Pugsley; committee

on experiment station organization and policy, Dr. E. W. Allen, Prof. B. W. Kilgore, and Director R. W. Thatcher; committee on college organization and policy, President K. L. Butterfield, President J. H. Hamilton, and President W. M. Riggs.

The following were chosen officers of sections: *College section*, President R. A. Pearson of Iowa, chairman, and President Kenyon L. Butterfield of Massachusetts, secretary; *Station section*, Dean A. F. Woods of Minnesota, chairman, Dr. J. G. Lipman of New Jersey, secretary, Mr. W. H. Beal of Washington, D. C., recording secretary, and Prof. B. W. Kilgore of North Carolina, additional member of program committee; *Section on extension work*, Prof. Alva Agee of New Jersey, chairman, Prof. C. W. Pugsley of Nebraska, secretary, and Prof. John Hamilton of Washington, D. C., recording secretary.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

In the section on college work and administration two papers were read: (1) Development of the College and Station News Service, by President R. L. Slagle, and (2) Shall Practical Experience be Required Before Granting the Bachelor's Degree in Agriculture? by Dean E. A. Burnett.

President R. L. Slagle described the news service of the South Dakota College and Station as it has been carried on for one year, consisting of (1) press bulletins, (2) plate service, the college supplying copy and illustrations in the form of stereotype plates to such papers as use such material, (3) special service to papers that do not use plate, consisting of brief popular articles furnished in manuscript form, and (4) special service to daily papers. He also described the features of the news service in a number of other institutions, and called attention to the fact that in Wisconsin and Illinois this service is charged with the editing of station bulletins as well as with the publicity work, while in Kansas and Iowa the publicity work is in charge of departments of agricultural journalism, in which instruction is given to students concerning the preparation of articles for newspapers, reporting, proof reading, etc.

President W. M. Riggs, discussing this subject, called attention to the difficulty of getting the newspapers in South Carolina to publish material contained in their bulletins, and to a scheme adopted of furnishing items concerning their publications to the student correspondents of local papers in different parts of the State. These press notes are mingled with other items in the students' correspondence, and in this way many are published which might otherwise be thrown out.

President Soule described the news service of the Georgia State College of Agriculture, one feature of which is the daily "story" or interview with some college professor which this service gives out to the press.

President E. A. Bryan warned against the danger of misleading the public through the adoption of sensational methods in order to get material published.

Discussing the question Shall Practical Experience be Required Before Granting the Bachelor's Degree in Agriculture? Dean Burnett mentioned two reasons that have been advanced for requiring such experience: (1) That the student who has had farm experience is better able to pursue his college work in agriculture, and (2) that after graduation such a student is better able to understand the problems with which he comes in contact.

Dean Burnett expressed the opinion that farm experience should be required, either in the institution or outside of it. The matter is assuming greater importance of late on account of the large percentage of students from the cities and towns. Of the institutions referred to in his paper, 31 required no farm

experience, 8 favored it but did not enforce it, and 7 required an examination in the subject, or in lieu of that summer residence at the colleges or on approved farms.

SECTION ON EXPERIMENT STATION WORK.

In discussing Branch Experiment Stations, Dr. H. L. Russell expressed the belief in concentration in station work as far as practicable, but pointed to the frequent necessity for carrying on special work under local conditions, which called for branch stations. The location of substations on a geographical basis was deplored. Unless there is demand for work covering more than one line, substations should not be established but cooperative work and the utilization of temporary facilities should be relied upon.

Work at the branch stations should be supervised by men from the central station representing the several specialties involved. There should not be a high salaried superintendent who is ambitious to develop an independent station. The station should control and own the land it uses rather than lease it. The work there should be primarily experiment and research, although the opportunity may be utilized to demonstrate some facts. A distinction was recognized between branch stations and demonstration fields.

In discussing the paper, Dr. W. H. Jordan regarded permanent substations as uneconomical and their establishment as inadvisable. The problem should govern the activities of the station away from its central location, and it should go where the problem calls, using leased land for such periods as necessary. Dr. Russell pointed out that the problems frequently require the development of the land, introduction of improvements, drainage systems, etc., which implies ownership.

Director F. B. Linfield referred to the differences in climate as requiring local treatment. In a State like Montana he held permanent branch stations to be needed. These are supplemental to the home station and are under its control.

Prof. F. W. Morse described the cranberry and asparagus stations in Massachusetts, the former permanent and the other on a cooperative basis.

Prof. J. H. Shepperd, of North Dakota, outlined the system of branch stations in North Dakota, which are designed to work out special problems of districts, and are under central control and supported by special state appropriations. There are now five of these and there has been a movement for more. The tendency has been to establish more than are actually needed, and they absorb funds that might otherwise come to the state station. To satisfy the demand demonstration farms have been started.

Director C. F. Curtiss held that the substations should be established to extend the facilities for the station's work, and should be located with reference to this, the station determining where it is desirable to reach out.

Director B. W. Kilgore expressed approval of the test farms as conducted in North Carolina. There are five of these, established on the basis of soil and climatic differences. The work done there was considered as profitable as that at the main station. It is planned by the heads of divisions in the central stations, and carried out by a superintendent who works under direction. Often work at the main station is duplicated at one or more branch stations.

Director E. H. Webster considered the five branch stations which have been provided by the legislature in Kansas to be very expensive for the returns that can be secured from them. They were looked upon as a burden; and their existence creates a desire on the part of other localities for a local station.

In a paper on Station Demonstration Farms, Director C. E. Thorne described the four district farms in Ohio. These are a part of the main station, except that they are removed from it by distance. They are directed by the depart-

ments at the station. Two represent different types of soil and two others special crops—tobacco and sugar beets. It has not been found that these stations divert money from the main station, but rather that they stimulate appropriations for the latter by increasing interest. They are used primarily for research, and the demonstration features are purely secondary. The station also has in charge county experimental farms, located by the board of control acting in cooperation with the county commissioners. The latter cooperation has not been found helpful and will be eliminated.

Under the title of County Experimental and Demonstration Farms, Director E. H. Webster outlined the experience in Kansas in attempting to utilize county poor farms for experimental and demonstration work. Twelve of these were operated originally but the number has been cut to three or four, and the work there is at present not active. These farms were not found satisfactory places to work, owing to the conditions surrounding them. In place of this work the station is carrying on cooperative work with about a thousand farmers under a state appropriation of $7,500 a year. These cooperative fields are directed from the station and are conducted under contract. They are made centers for the community, and are much more satisfactory than the poor farms.

Prof. J. H. Shepperd described a system of twenty-four county demonstration farms which have been running for many years in North Dakota. The station leases from 20 to 25 acres of land, which is divided into plats and run on the basis of a good farming system for the locality. These farms are under the supervision of three men from the station who go about among them, visiting them every week or ten days. The farmer reports daily the weather observations and what he has been doing. Incidentally these farms are helping out the plan for better seed distribution, the station inspecting and certifying the seed grown by the farmers conducting them.

As to the cost of this work, Director A. F. Woods, of Minnesota, stated that it cost the station $12,000 a year to supervise 40 farms. These are farm management demonstrations, representing different conditions in the State.

The Relation of Farm Management Work to Other Departments of the College and Experiment Station was discussed by Prof. W. J. Spillman of this Department. Farm management, he stated, does not tell how to grow corn or to feed pigs, but whether to grow corn or feed pigs, and how much corn and how many pigs can be grown or fed profitably under existing conditions. Farm management men are dealing with the interrelations of the various farm problems and are endeavoring to answer the questions "what" and "how much?"

In considering the relations between farm management and rural economics, Prof. Spillman pointed out that the farm is the unit of consideration in farm management and it does not, like rural economics and rural sociology, deal with the relations between farms or with relations involving larger units than the farm. In his opinion farm management may be made a subject of investigation or of research work comparable in scientific value to research work in other branches of agriculture.

Prof. G. N. Lauman, in discussing this subject, called attention to the fact that in Europe there is a considerable body of knowledge and published material concerning farm management and rural economics which should be studied by people in this country; and Dean H. C. Price expressed the opinion that rural economics is a general term, of which farm management, rural sociology, and rural economics are parts.

At another session of the section there was a series of three papers on station publications, one relating to the number of series, another to popular bulletins, and a third to the station mailing list.

In a paper on Station Publications, How Many and What Series? Dr. E. W. Allen called attention to the wide variation in the character of station publications and the desirability of restricting them to the present field of the stations. Viewing the experiment station as an institution or department for acquiring and testing knowledge in its relation to agriculture, as differentiated from the extension and teaching service, the issue of four separate series of publications was recommended: (1) Technical or research bulletins, devoted to reporting the more technical work of the station which is not of immediate interest to the general public, (2) regular bulletins reporting the results of the station's experiments and investigations in so far as they are of general interest, (3) circulars, to serve as a less permanent or briefer means of communication, and (4) the annual report or résumé of progress.

All of these should be the product of the station's work, and should report its activities and its findings. "The clearer definition of function between the experiment station, the college, and the extension department has prepared the way for a closer restriction of station publications to a discussion of findings and their application." This would not exclude popular accounts of the station work, but would not include the compilations based largely on common sources of information. The matter should be so presented that it will be evident to the reader what new contributions are involved and how much of credit for originality is due.

The Purpose and Preparation of Popular Bulletins was discussed by Mr. F. H. Hall, who described the series of popular editions put out by the New York State Station. In New York the popular edition has made the bulletins much more effective, and satisfies the demand of a large proportion of people. Where the full bulletin is desired it is sent. A considerable yearly saving was calculated from the issue of the popular edition, and the editor who prepares these bulletins also has time to attend to the editing and proof reading of the regular editions.

The Station Mailing List was considered in a paper by Director A. F. Woods. Information had been collected on a questionaire in regard to the number of series of publications issued, the handling of the mailing lists, and method of distribution. The classification of mailing lists was found to be on a variety of bases—according to different series, by subject, by geographical location or section, etc. The plan of classifying the mailing list by subjects was found to be on the increase and was heartily endorsed by many as avoiding a considerable waste of bulletins. Where stations issue a considerable number of bulletins it was advised to substitute the mailing machine for hand labor. Different classes of machines for accomplishing this were described.

At a joint session of the section with the section on college work and administration, a historical paper by Dean Eugene Davenport on the American Agricultural College was read. This paper has been referred to editorially in a previous issue.

SECTION ON EXTENSION WORK.

The subject of Training Extension Workers was discussed by Prof. W. D. Hurd and Prof. Alva Agee. The first speaker held extension teaching to be a form of education, on a par with and worthy of classification with the older recognized forms of instruction; and that the men who are to teach in this department must possess as high qualifications as any who give instruction to resident students.

He must not only be qualified as a teacher but also possess organizing ability of high order, and be expert in judging men,—having tact, common sense, and

appreciation of the difficulties that rural people have to meet. He must know his subject, should have college training, must be a specialist, and have had successful experience in the line of work he is undertaking to teach.

The second speaker called attention first of all to the kind of man that the "trainer" should be—that the trained man was a product, and that back of him was the expert who fitted him for his work. This trainer should be a man of large experience, should believe in agriculture, should be possessed of high character, and also be a scholar of acknowledged ability in directions other than agriculture. He should be capable of producing a skilled worker in a reasonable length of time, out of material of fair quality and which has had suitable previous training.

In a general discussion of Special Trains as a Means of Extension Teaching, the value of instruction trains was generally attested, but it was felt that to be most beneficial they should be followed up by some more permanent form of teaching, as the movable school, the local adviser, the demonstration in field, orchard, or barn. The consensus of opinion seemed to be that a single-topic train was most effective, particularly after the people had been aroused by those of a more general character.

The following points were brought out: It is best for the instruction force to control the train rather than the railroad company; strict discipline should be maintained while the train is out; all exhibits excepting those illustrating the teaching should be excluded; a bulletin giving a synopsis of the address made should be put in the hands of every person present; a proper period for the stops for a single-topic train is about one and one-half hours.

It was recommended that the same lecture be delivered in each car so that all may have opportunity to get the information. When a train is late or behind its schedule, the address of each speaker should be cut until the time is made up, rather than to omit entirely one or more of the addresses from the schedule. What each man shall teach should be prescribed so as to insure harmony in the facts presented.

A round-table discussion was held upon What the Extension Departments can do to Forward Industrial Education in the Public Schools. It was suggested that lecturers could be sent to give instruction in teachers' institutes, and that suitable publications could be prepared and issued for distribution among the teachers in schools giving information as to the method of teaching agriculture to country children. Teachers should also be invited to attend the summer short courses at the college, and possibly district short courses could be organized for teachers in the various sections of the State.

JOINT SESSION.

A symposium on Cooperation in Extension Service Between the United States Department of Agriculture and the Agricultural Colleges, held at a joint session of the experiment station and extension sections, developed considerable difference of opinion as to the extent and the character of such cooperation, and a noticeable apprehension over the recent extension of this activity in the northern States.

Dean F. B. Mumford maintained that agricultural extension is a work to be carried on by the State, and that if the Department comes into the State at all to take part in such work it should be to assist the institutions rather than to work independently or to conduct separate enterprises. This view received considerable support.

Director C. E. Thorne and President H. J. Waters dwelt on the possibility of cooperation to a rather large extent, and gave illustrations of the advantages to be derived. They felt, however, that the state institutions should be fully recognized in extension enterprises within the State, and that their position of leadership should not be interfered with.

The present plan of the Department for conducting field work in extension and demonstration was described in a paper by Dr. B. T. Galloway, read by Mr. W. A. Taylor, of the Bureau of Plant Industry. This led to a discussion of the farm management work and the establishment of local or county agents in the various States. It was maintained that this is to be done only in cooperation with the agricultural colleges, whose advice and collaboration will be sought, whether or not they have funds which are immediately available to contribute toward the undertaking.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The organic-phosphoric acid compound of wheat bran, R. J. ANDERSON (*New York State Sta. Tech. Bul. 22, pp. 2–16*).—The chief purpose of this work was to determine the nature of the organic phosphorus body removed from wheat bran by extraction with a dilute acid and to determine what bases are associated with it. As a result of examining the organic phosphorus compound none of the salts characteristic of phytic acid could be isolated.

"The purified barium salts of the compound corresponded to the following formulas: $C_{25}H_{55}O_{54}P_9Ba_5$ and $C_{20}H_{45}O_{49}P_9Ba_5$. Attempts to isolate the free acid corresponding to the first salt did not succeed. From both salts the same acid, corresponding to that of the second salt, $C_{20}H_{55}O_{49}P_9$ was obtained. This acid is apparently formed from the first by the splitting off of the elements of one pentose. Crystalline salts of the acid $C_{20}H_{55}O_{49}P_9$ with inorganic bases could not be obtained. A crystalline brucin salt $C_{20}H_{55}O_{49}P_9(C_{23}H_{26}O_4N_4)_{10}+30H_2O$ was easily formed. Since all the purified barium salts prepared under different conditions, either from the previously isolated crude substance or from the bran extract itself, could all finally be changed into salts of the acid $C_{20}H_{55}O_{49}P_9$ under liberation of reducing substances, the conclusion seems justified that this acid is the only organic phosphoric acid present and that wheat bran does not contain phytin."

"The 0.2 per cent hydrochloric acid extract of bran contains some dissolved proteins. On precipitating with alcohol these are thrown down together with the phosphorus compounds. Their presence makes the subsequent purification difficult, especially the filtrations, because the proteins have been rendered more or less insoluble and form a fine slimy mass which clogs the filter paper to such an extent as to make filtration even by suction extremely tedious."

In order to obviate this the bran extract was first treated with tannic acid. "The addition of tannic acid caused a voluminous and very fine precipitate which after standing a short time became coarser and was easily removed by simple filtration. The resulting filtrate is nearly colorless or of light amber color. Alcohol produces in this solution a nearly colorless precipitate which is much more easily purified than the product obtained without first precipitating with tannic acid.

"With only this modification some of the substance was prepared from wheat bran. It was found, however, to differ slightly in composition from that obtained by the first method. On analysis the following results were obtained: Carbon 19.51, hydrogen 3.09, phosphorus 15.23, calcium 0.38, magnesium 7.35, potassium 2.75, and nitrogen 0.57 per cent. On treating this substance with barium hydroxid and purifying the resulting precipitate in the same way as before the same barium salt was obtained: For $C_{25}H_{55}O_{54}P_9Ba_5=2184$. Calculated carbon 13.73, hydrogen 2.51, phosphorus 12.76, barium 31.44 per cent. Found carbon 13.00, hydrogen 2.46, phosphorus 12.47, barium 33.00 per cent. The difference in composition of the crude substance must therefore be due to the smaller amount of the nitrogen-containing body which this preparation

was found to hold. In the analysis of the crude substance only 0.57 per cent nitrogen was found, whereas the first preparation had four times, and the second preparation two times, as much."

The author expects to carry out a complete investigation of the organic phosphorus body of wheat bran, especially to isolate and to identify the reducing bodies which are formed as a result of cleavage with dilute acid. He is also to take up the study of the nitrogen-containing substance mentioned above.

Investigations in regard to colostrum, A. BURR, F. M. BERBERICH, and A. BERG (*Molk. Ztg. [Hildesheim], 26 (1912), Nos. 43, pp. 799, 800; 46, pp. 851, 852*).—This is a chemical and physical study of colostrum. Many of the newer methods now employed in milk chemistry were applied.

Note on the refractivity of the products of the hydrolysis of casein, and a rapid method of determining the relative activity of trypsin solutions, T. B. ROBERTSON (*Jour. Biol. Chem., 12 (1912), No. 1, pp. 23–29*).—It is shown that the hydrolysis of sodium caseinate by trypsin does not alter the refractivity of the solution within the limits of accuracy of the determination. A method for comparing the activity of trypsin solutions, based upon this principle, is given in detail.

Laboratory studies of rennin, A. ZIMMERMAN (*Abs. in Science, n. ser., 35 (1912), No. 897, p. 382*).—This work considers the following points: "The variation in the length of time required to curdle different specimens of milk by rennin and how this is influenced by the milk, according to the length of time it is kept after the milking; standardizing rennin to use as a control in rennin assay, for more accurate results; the acceleration of the action of rennin upon milk by phosphoric acid; the effect of alkalis upon milk, causing a variation of the length of time required to curd the milk by rennin; the influence of heat in changing the acidity of milk, kept for a varied number of hours after the milking."

In regard to the inhibition of rennet action, S. G. HEDIN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 5–6, pp. 355–368; abs. in Chem. Zentbl., 1912, I, No. 16, p. 1322*).—By treating with ammonia a neutral infusion obtained from hogs' stomachs a substance is obtained which inhibits rennetic activity of hog-stomach extracts but does not influence other rennet preparations. This inhibiting property was found to remain in part after boiling the infusion. If the zymogen obtained by the ammonia method is neutralized with dilute hydrochloric acid the solution is found to contain active free rennet, but if the solution is treated with hydrochloric acid after it is boiled the inhibiting power is not lost. When the original zymogen infusion is treated with hydrochloric acid and neutralized, whereby the rennet is activated, and then treated with ammonia and neutralized, no inhibiting substance is obtained. Calves' rennet on being boiled yields an inhibiting substance which, however, is not specific and does not exhibit the usual properties mentioned above. Rennet obtained from the guinea pig and the pike, when treated in the above manner, showed no inhibiting qualities.

In regard to cellulase, H. EULER (*Ztschr. Angew. Chem., 25 (1912), No. 6, pp. 250, 251; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 5–6, p. 231*).—The cleavage of cellulose by enzyms has not been definitely established on account of the fact that questionable substrates like hemi-, oxy-, and hydrocellulose have been used. It is believed that better results may be obtained by using cellulose-dextrin. This is prepared by treating Swedish filter paper with a 75 per cent solution of sulphuric acid at 30° C. for 6 hours, removing the acid by precipitation, dializing the resulting filtered solution, and concentrating the dialized solution until it contains about 7 per cent of total solids (providing no

sugar and ash are present). Some tests with this compound and the press juice from the mycelium of *Merulius lacrymans* are reported.

Tests in regard to the origin of aldehyde-catalase and the possibility of using the results of the same for certain purposes, G. SALUS (*Arch. Hyg., 75 (1912), No. 8, pp. 371–382*).—Tests conducted with press juices and dry tissue obtained from the mammary gland of cows and also with whole milk show that reductase (aldehyde-catalase) is probably a product of cellular activity and is closely connected with the process of milk formation. A possibility also exists that the results obtained from the reductase test will serve as a quantitative expression as to whether or not a cow is a good milk producer.

Saccharification of starch by hydrogen peroxid alone or in the presence of plant or animal amylases, C. GERBER (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 23, pp. 1543–1545*).—The hydrolysis of starch by hydrogen peroxid simulates that brought about by enzyms, i. e., first maltose and then the remainder of the cleavage products are produced. The hydrolytic process proceeds very rapidly and its rate is in proportion to the degree of heat applied. Small amounts of hydrogen peroxid were found to act diversely upon the saccharification produced by amylases (*Ficus carica, Broussonetia papyrifera,* and trypsin). Amylase was found to possess various degrees of resistance toward hydrogen peroxid, much depending upon the source of the enzym.

Neutral ammonium citrate solution, A. J. PATTEN and C. S. ROBINSON (*Jour. Indus. and Engin. Chem., 4 (1912), No. 6, pp. 443–446, figs. 2*).—Previously noted from another source (E. S. R., 26, p. 98).

Note in regard to the qualitative detection of nitric acid in the presence of an excess of nitrous acid, H. K. SEN and B. B. DEY (*Ztschr. Anorgan. Chem., 74 (1912), No. 1, pp. 52–54; abs. in Chem. Zentbl., 1912, I, No. 15, p. 1250*).—The method is based on the fact that hydrazin sulphate reacts with nitrous acid without affecting any of the nitrate which may be present in the solution. In some tests with pure recrystallized sodium nitrite and hydrazin sulphate no blue coloration was obtained with diphenylamin at the end of the reaction, while in some tests with the urea method nitric acid was noted. The hydrazin method is therefore to be given the preference over the urea method.

The determination of nitrates and nitrites in drainage and rain waters by Schlösing's method, A. HUIZINGA (*Ztschr. Analyt. Chem., 51 (1912), No. 5, pp. 273–292*).—It is stated that the results obtained with the old method (evaporation with magnesia and treating the gas obtained with sodium hydroxid) are not always correct, because of the presence of nitrites in the water under examination. To obviate these errors the following recommendations are made: (*a*) The fluid should be evaporated after it has been treated with a potassium hydroxid solution. (*b*) The treatment of gas with sodium hydrate can be dispensed with if the carbonates are destroyed previous to evaporation. Any nitrite which may remain after the oxidation of the organic substance can be removed by oxidation with permanganate in an acid solution. The method for doing this is described.

Determination of humus, especially in heavy clay soils, W. BEAM (*Cairo Sci. Jour., 6 (1912), No. 68, pp. 93–103*).—"In the case of heavy clay soils and especially those containing little organic matter, washing with water until the filtrate is neutral can not be relied upon to remove the excess of hydrochloric acid remaining after the extraction of the calcium. The form of filter best suited to the complete removal of the acid, and also to the ready and complete extraction of the humus by ammonia, is that furnished by a Buchner funnel and the use of a layer of asbestos as well as a supporting disc of paper. The soil should be mixed with sand and the mixture covered by a layer of sand and a protecting disc of filter paper. The removal of the hydrochloric acid is best

accomplished with a cold solution of carbon dioxid, in order to avoid puddling the clay. In cases in which the humus is very low, the use of carbon dioxid water and the filter described above was found to be the only practicable method of carrying out efficient filtration. Complete extraction of humus from soil can only be accomplished by repeated treatments with the ammonia solution. Methods depending upon a single extraction with a measured volume of ammonia yield results below the truth. The removal of clay from suspension in humus solution is readily accomplished by the use of ammonium carbonate, as suggested by Rather, but the clay so precipitated carries with it a portion of the humus.

"With suitable precautions the use of ammonium carbonate offers a reliable and satisfactory method for removing the clay from the humus solution. For the reasons given above the modified 'official' method suggested by Rather, may, in the case of soils poor in humus, give results as much as 50 per cent below the truth. Unless the greatest care is taken to avoid too long heating of the dried humus residue, and frequently notwithstanding such care, the Mooers-Hampton method fails when applied to Nile soils. Complete solution in ammonia, after evaporation to dryness, can not always be effected."

A method for the colorimetric determination of humus recommended by the author is as follows: "The equivalent of 5 gm. of the dry soil is placed in a Gooch crucible with asbestos filter and extracted with 1 per cent of hydrochloric acid until the filtrate is free from calcium. The soil is then conveyed, without washing with water, to an enameled iron cup, and boiled up for 10 minutes with 5 per cent sodium carbonate solution. During the boiling it is well to cover the cup with a flask filled with cold water. At the end of 5 minutes the flask is removed and the contents of the cup well mixed. The cup is then covered and the boiling continued for the remaining 5 minutes. The liquid is allowed to cool, after which it is made up to 250 cc., mixed, and centrifuged or allowed to stand over night. The practically clear supernatant liquid is then decanted through an asbestos filter in a Gooch crucible. The comparison is made with a soil of known humus content which is treated in the same way. The color of the humus solution is one which permits of very accurate estimation."

Method for ashing foodstuffs and other organic substances for the purpose of making a determination of phosphoric acid in the same, A. VOZÁRIK (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 5–6, pp. 426–432; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 5–6, pp. 188, 189*).—For determining the phosphoric acid content of foods, etc., the author proposes the following ashing method:

From 1 to 3 gm. of finely powdered material is placed in a platinum crucible containing 0.2 gm. of finely powdered magnesium oxid, mixed with a glass rod, and then heated until the mass is completely carbonized. The Bunsen flame during the process is directed toward the rim of the crucible and the heating is so conducted that the destruction of the organic substance is uniform. Substances of animal origin require between ½ and 2 hours, plant material from 2 to 3 hours. The phosphoric acid can then be determined either volumetrically or gravimetrically.

In regard to the titration of phosphoric acid with a uranium salt in foods and other organic substances and the errors in the method, A. VOZÁRIK (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 5–6, pp. 433–456; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 5–6, p. 189*).—The solution to be titrated must contain no phosphate which gives an acid reaction with phenolphthalein and no aluminum iron phosphate. The presence of free acetic acid is also detrimental, and its activity begins when an amount of 0.36 per cent and

the indicator cochineal is employed, and 0.6 per cent when potassium ferrocyanid is used as the indicator. Sodium, ammonium, and magnesium acetates in amounts of from 0.42 to 0.75 per cent show detrimental effects. Mineral acids with cochineal give high results for the titration, while those obtained with potassium ferrocyanid will be low.

Inorganic phosphorus in plant substances: An improved method of estimation, R. C. COLLISON (*Jour. Biol. Chem., 12 (1912), No. 1, pp. 65–72*).—In all probability some of the failures to demonstrate the presence of inorganic phosphorus in seeds are due to imperfections in the analytical methods. Phytin, for instance, when present has an influence upon the precipitation of phosphorus. As shown in previous work some of these difficulties may be removed by the method of Forbes et al. previously reported (E. S. R., 23, p. 303), which avoids the necessity of precipitating the phosphorus in the presence of protein and salts of phytic acid. With the method appreciable quantities of inorganic phosphoric acid were found in oats, wheat, and corn seeds, soy beans, cowpeas, rice polish, alfalfa hay, and blue grass.

When the extracts were from materials low in organic matter (hays, etc.), the results were satisfactory, but where much organic matter was present, as is the case with extracts of legumes, the solutions were extremely difficult to filter and the results were high. In some instances, however, the results were low because of the influence which the organic substances present exerted upon the precipitation of the magnesium ammonium phosphate. With a view of obviating the above errors the method has now been improved and is as follows:

"A 10 gm. sample of the substance, very finely ground, is placed in a 400 cc. flask and covered with exactly 300 cc. of 94 to 96 per cent phosphorus-free alcohol, which contains 0.2 per cent of hydrochloric acid (calculated from the percentage of hydrochloric acid in the concentrated acid). The flask is shaken at intervals of 5 minutes for 3 hours. The extract so obtained is then filtered through dry, double 11 cm. filters into dry flasks. No suction is necessary. An aliquot of 250 cc. of this filtrate is placed in a 400 cc. beaker and made just alkaline to litmus paper with ammonia. A slight excess of ammonia does no harm. The solutions are allowed to stand from 8 to 12 hours or over night and then filtered through double 11 cm. filters, care being taken to decant the clear liquid as far as possible.

"The precipitate is then transferred to the filter and washed with 94 to 96 per cent alcohol, which has been made just ammoniacal. In transferring the precipitate some of the material may stick very tenaciously to the beaker. In this case, after cleaning the beaker fairly well, add 5 drops of hydrochloric acid to the beaker, rub out the latter with a rubber tipped rod, add 10 cc. of alcohol and then make just alkaline with ammonia and transfer this last portion to the filter. In this way the last traces of the precipitate can be easily removed.

"After washing several times, the inner filter with the precipitate is spread out and allowed to dry completely. It is then transferred to an Erlenmeyer flask containing exactly 100 cc. of 0.5 per cent nitric acid in water (calculated from the percentage of nitric acid in the concentrated acid). The flask is stoppered and the contents thoroughly shaken until the paper and precipitate are broken up. It is best to let it stand for some hours. The material in the flask is then filtered through dry, double 11 cm. filters into dry beakers and exactly 75 cc. of the filtrate precipitated with 50 cc. of official acid molybdate solution in the usual way; 10 gm. of ammonium nitrate and 2 hours' digestion at 60° C. are usually sufficient. The final results represent the amount of inorganic phosphorus in 6.25 gm. of the original sample.

"It is advisable to reprecipitate the pyrophosphate if the final solutions are highly colored, which is sometimes the case with some of the rough feeds, as the hays. In the case of such substances, which are relatively high in inorganic phosphorus, a smaller sample may be taken, 3 to 6 gm. In using this method with substances which are tenacious and gummy, and which do not break up readily in acid alcohol, as is true of dried fruits and other substances containing considerable sugar, the same may be worked up with sand and a definite quantity of water; 15 to 20 cc. are usually sufficient. This may be done in a mortar and the material washed out into the flask with acid alcohol, care being taken to use the correct volume, namely, 300 cc. minus the quantity of water used. This method deflocculates substances the most refractive in this regard."

The results of some tests with the method and cereals, legumes, hays, etc., with and without the addition of extraneous inorganic phosphates, are reported.

A method for the determination of the specific gravity of wheat and other cereals, C. H. BAILEY and L. M. THOMAS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 99, pp. 7, fig. 1*).—This method is based on the displacement of toluene by a weighed portion of the grain in question, and is described in detail. A special form of picnometer is used for this purpose, and is illustrated.

The use of the quantitative precipitin reaction for examining honey, J. THÖNI (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesundheitsamt., 3 (1912), No. 2, pp. 74–94*).—Continuing previous work (E. S. R., 28, p. 365) the author has studied this reaction with heated honeys, and also the variations which may take place in the amount of precipitate produced when the same antiserum is employed with authentic honeys. In addition to this, some biological analyses (diastase and catalase) of adulterated, denaturized, and so-called feed honeys are reported, and the Fiehe reaction was also applied.

The figure for the quantity of precipitate was found to be only relative. When the same antiserum was employed the results were comparative, but it differed when another antiserum was used. Honeys heated to near the boiling point of water showed a decrease in the amount of precipitate produced by the antiserum. If the heating was continued to the boiling point and maintained there for 1 hour no precipitate was produced.

Determination of sucrose in cane molasses: Use of hydrochloric acid and urea, of sulphurous acid, and of acetic acid, H. PELLET (*Internat. Sugar Jour., 14 (1912), No. 162, pp. 321–344*).—In order to obtain correct results by the optical inversion method it is necessary to conduct the direct polarization under such conditions that on inversion with hydrochloric acid the difference of rotation is due only to inverted sucrose. The polarization before inversion must be made at the same degree of acidity which is to prevail after inversion. This can be accomplished with the urea and hydrochloric acid method, and also with the sulphurous acid method under certain conditions. Acetic acid is too weak a reagent and only destroys the reducers of the basic lead acetate used for clarification without affecting the levulose. The results obtained before inversion are not comparable with the polarization after inversion; hence, the figures found for sucrose can not be considered accurate when acetic acid is employed.

A quick method for detecting salicylic acid, L. STEINITZER (*Ann. Falsif., 5 (1912), No. 43, pp. 229–233*).—A small quantity of the material to be examined is extracted at ordinary temperature with 10 cc. of ethylene dichlorid without strong agitation. (If too strongly shaken emulsification will take place.) The ethylene chlorid extract, which contains the salicylic acid, is washed with water

by decantation, the solvent evaporated, and the Jorissen test for salicylic acid applied. The ferric chlorid test can be used directly with the washed ethylene dichlorid solution containing salicylic acid.

The determination of tartaric acid, P. B. DUNBAR (*U. S. Dept. Agr., Bur. Chem. Circ. 106, pp. 9, fig. 1*).—As the procedure proposed by Yoder for the determination of malic acid (E. S. R., 24, p. 612) could not be applied successfully to the estimation of tartaric acid, a study was made of the conditions under which the effect of uranyl acetate on the rotation of this acid would be proportional to the amount of acid present in a given solution. This was found to be in solutions containing from 0.2 to 3 gm. of tartaric acid in 100 cc., although the most favorable concentration was between 0.5 and 2 gm. per 100 cc. Solutions containing as low as 0.2 gm. per 100 cc. could be used, but often the color of the solutions interfered with the reading. It was also found necessary to precipitate tartaric acid from solutions containing other optically active substances affected by uranyl acetate. This was done with dry powdered normal lead acetate, the excess of lead being removed with anhydrous sodium sulphate. The ratio of tartaric acid concentration to rotation determined was 0.051, obtained by treating solutions of the acid with uranyl acetate, determining the rotation in degrees Ventzke, and dividing the number of grams of acid in the solution by the rotation. The details of the method are as follows:

"(1) Measure 85 cc. of the solution under examination into a 100-cc. graduated flask, render the solution slightly alkaline to litmus paper with sodium hydroxid, add 5 gm. of sodium acetate and shake until dissolved. Reacidify the solution to litmus paper with a strong solution of citric acid, adding a slight excess of the acid, cool to room temperature, and dilute to 100 cc. Treat about 30 cc. of this solution with powdered uranyl acetate, transfer to a suitable container, and shake for 3 hours with a mechanical shaker. Add enough uranyl acetate so that a small amount remains undissolved after 3 hours' shaking; from 2 to 3 gm. is usually sufficient. If the uranium salt dissolves, more must be added. Filter through a folded filter and polarize, if possible in a 200 mm. tube. After polarizing, agitate the solution for an hour longer with uranyl acetate and again polarize to determine whether a maximum rotation has been obtained. Calculate the reading in degrees Ventzke to the basis of the original solution and designate as (1).

"(2) Treat about 50 cc. of the original solution with dry powdered normal lead acetate until no further precipitation results; avoid excess of the precipitant. A centrifuge can be used to advantage in settling the precipitate. Filter through a folded filter and test the filtrate with a small crystal of lead acetate to determine whether precipitation is complete. Remove the excess of lead with powdered anhydrous sodium sulphate, filter until clear, and polarize in a 200 mm. tube. Designate this reading as (2). If the solution is supposed to contain less than 0.5 per cent of tartaric acid and more than 10 per cent of sugar, treat the tartaric acid free solution with powdered uranyl acetate and shake at intervals for 1 hour. Filter and polarize. If the reading so obtained is less than (2), it should be used instead of (2) in the final calculation.

"(3) Polarize at room temperature with white light, taking care that all solutions are polarized at the same temperature. Make at least 6 readings on each solution and take the average of these. Calculate all readings to the basis of a 200 mm. tube. Multiply the algebraic difference in degrees Ventzke between readings (1) and (2) by the factor 0.051. The result will equal the weight of total tartaric acid in grams in 100 cc. of the original solution.

"In this work a standard, Lippich type, triple-field saccharimeter was used, the light being furnished by an electric stereopticon bulb placed behind a ground-glass plate. . . . After reaching a maximum, the rotation of the uranium-tartaric solution remains constant and solutions may be kept overnight before polarizing. They must be kept in a dark place, however, as they are darkened by exposure to daylight."

Large amounts of pectin bodies when present may be removed by precipitation with from 2 to 3 volumes of alcohol, washing the precipitate with 95 per cent alcohol and then concentrating the filtrate to its original bulk. Di-sodium phosphate and ferrous sulphate when present in the solution had no effect upon the results, but potassium alum did.

Tests made with sugar solutions and fruit juices (strawberry, raspberry, and blackberry), containing known amounts of added tartaric acid, showed that the results obtained with blackberry juice and the lower concentrations of raspberry juice varied most widely from the theoretical figures. This was probably due to the high color which the solutions had, but attempts to obviate this difficulty resulted negatively.

The determination of malic and tartaric acids in the same solution, P. B. DUNBAR (*U. S. Dept. Agr., Bur. Chem. Circ. 105, pp. 8*).—The purpose of this paper was to present some preliminary notes on a new method for the determination of malic and tartaric acids in the same solution. In the experiments advantage was taken of the fact that malic and tartaric acids, like lactic acid, are converted quantitatively into oxalic acid by oxidation with potassium permanganate (E. S. R., 26, p. 24), and furthermore that solutions of both malic and tartaric acids, when treated with uranyl acetate, show an increased rotation, which within certain limits is proportional to the concentration.

Accordingly, "knowing the total rotation produced by these acids on treatment with uranyl acetate and either the amount of oxalic formed by oxidation or the amount of potassium permanganate reduced, it is possible to calculate the amounts of malic and tartaric acids present in a solution. The presence of substances which form oxalic acid on oxidation and which can not be removed before treatment with potassium permanganate interferes with the method."

The determination of arsenic, C. R. SMITH (*U. S. Dept. Agr., Bur. Chem. Circ. 102, pp. 12, figs. 2*).—"The methods here recommended are concerned with the estimation of amounts of arsenic, ranging from 1 micromilligram to 10 or more milligrams, and include particularly various modifications of the Sanger-Black-Gutzeit determination of arsenic which seem to improve its accuracy and practicability, new methods for measuring of the arsin from comparatively large amounts of arsenic, and a new method for the quantitative separation and concentration of varying amounts of arsenic from large quantities of organic and inorganic materials, including in particular the separation from antimony and tin."

Peanut butter, W. R. BEATTIE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 98, pp. 14, figs. 7*).—This circular describes the manufacture of peanut butter, under the headings of the stock, factory and equipment, roasting, blanching, blending, grinding, and bottling and packing.

Distillation of resinous wood by saturated steam, L. F. HAWLEY and R. C. PALMER (*U. S. Dept. Agr., Forest Serv. Bul. 109, pp. 31, figs. 7*).—Although a large number of plants have been built for producing crude turpentine by distillation with steam from sawmill waste or light wood, or both, many of them have been abandoned, probably because the turpentine was the only product obtained or the amount of crude turpentine obtained was lower than that produced by other processes. The quality of the turpentine produced by this

method is good and the process seems to be very promising when combined with others for "the utilization of the steamed chips, as, for instance, for the extraction of the rosin with volatile solvents. The process might be favored, also, where the material would be largely used as fuel, or wasted, or where it is very cheap, or so poor in quality that more complicated processes would not be profitable. These conditions generally obtain with the waste wood of sawmills now used as fuel at the plant or burned on the rubbish pile. In these fields the steam distillation of resinous woods will undoubtedly expand.

"There has been no uniformity in commercial practice nor in the opinions of the various operators as to the proper steam pressure, size of chips, or rapidity of distillation, and no experimental data have been published on the effects produced by these various, readily controlled variables."

"In this study of the distillation of resinous wood by saturated steam the effects of different variables have been considered: (1) Size of chip, (2) pressure of steam, (3) speed of distillation, and (4) end point at which distillation is stopped, on (a) the yield of total oil, (b) the composition of the oil, and (c) the amount of steam required to remove the oil. It can be seen that there should be a certain combination of values for these variables which would give the most economical method of operation for a steam distillation plant; but there are other factors which must be taken into consideration in determining the proper combination of values. For example, the best size of the chip will not be determined entirely by the effect of size on yield and efficiency, but also by the relative costs of preparing different sized chips and the use to which the chips are to be put after steaming; the best pressure of steam will not be determined entirely by the effect of pressure on yield and efficiency, but also by the relative costs of high and low pressure steam and of apparatus for various pressures; the best speed for the distillation will not depend entirely upon the effect of speed on the yield of products and on the amount of steam required, but also upon the cost of steam and the overhead charges; the best end point at which to stop the distillation will not depend entirely upon the effect of end point on yield and efficiency, but also upon the cost of the raw material and the value of the products.

"With the experimental data given, however, and with a knowledge of the various cost factors, which would naturally differ widely in different plants, it will be possible to decide readily on the most economical methods of operating."

METEOROLOGY—WATER.

Colorado climatology, R. E. TRIMBLE[1] (*Colorado Sta. Bul. 182, pp. 56*).—This bulletin summarizes meteorological observations which have been made for a number of years by the station at Fort Collins, at the substations at Rockyford and Cheyenne Wells, and at Longs Peak in Estes Park and Cowdrey in North Park. The climatic characteristics indicated by these and other observations are discussed.

"Nearly all the variations of a continental climate are to be found within the borders of the State of Colorado. The natural diversities which result from its location in latitude and the many variations caused by the difference in topography, the effect of the Rocky Mountains extending through the State, are well defined in many cases and cause many complex effects. Many important local features are not apparent in the averages of the principal atmospheric conditions which make up what is known as 'climate.' Two-fifths of the State is highly mountainous, and the rest of it plains and high mesas. About 40 per cent of the area is above 7,000 ft. in elevation. That portion of the State lying east of the mountains, or the plains region, is crossed by a

ridge which forms the watershed between the South Platte and the Arkansas rivers. The lowest point in the State is where the Arkansas River leaves the State a few miles below Holly, at an altitude of 3,370 ft., while Julesburg, 3,460 ft., on the South Platte, is the lowest point in the northeastern portion of the State. . . .

"The mean temperature of the State as a whole is 45°, and the average precipitation 15.60 in. . . . The usual track of storms being some distance northward, the State is generally dominated by the warm and dry quadrants of the low areas that move eastward with great regularity, and escapes in part the attendant precipitation of moisture, the high wind movement, and the sharp fluctuations of temperature. . . .

"The continental divide is also effective in moderating the winter temperatures of the eastern slope. When the distribution of the pressure is favorable to westerly winds, remarkable rises of temperature occur. These are called 'chinook' winds. . . . Chinooks are liable to occur at all seasons of the year, but the warmth is relatively greater in winter and therefore more noticeable when the mountain region is warmer in comparison with the plains than in summer, adding extra heat to the descending air."

The climate of Wisconsin and its relation to agriculture, A. R. WHITSON and O. E. BAKER (*Wisconsin Sta. Bul. 223, pp. 65, pl. 1, figs. 25*).—This bulletin is divided into three parts, dealing with (1) general principles of climate, (2) special conditions of climate and weather in Wisconsin, and (3) the relation of climate to the agriculture of the State.

It is stated that "the mean annual temperature for the eighty-odd stations scattered throughout Wisconsin is 43.3°. This average temperature varies from 48° for the southwest corner of the State to 39° for the northeast portion. . . . The mean winter temperature for the whole State is 17° (December 20°, January 14°, February 16°), ranging from 23.6° at Racine to 12.9° at Hayward. The mean spring temperature is 42° (March 29°, April 43°, May 55°), ranging from 47.4° at Dubuque to 37° at Bayfield. The mean summer temperature is 67° (June 65°, July 69°, August 67°), ranging from 71.4° at Prairie du Chien to less than 60° upon the outer Apostles' Islands. The mean fall temperature is 47° (September 60°, October 48°, November 33°), ranging from 52° at Racine to 43° at Butternut.

"The northern portion of the State averages about 8° cooler in winter than the southeastern portion, about 5° cooler in spring, about 4° cooler in summer, and about 6° cooler in fall. . . .

"The coldest temperature reached in the average winter varies from 15° below zero along Lake Michigan south of Sheboygan, to 35° and 40° below zero in the interior northwestern portion of the State. The highest temperature ever recorded in the State was 111° at Broadhead, Green Co.; and the lowest, 50° below zero, at Hayward and also at Mauston. . . .

"The length of time from frost to frost varies as widely in Wisconsin as in any other eastern State, ranging from 175 days at Dubuque to 75 days on the Iron ranges along the Michigan border."

There is shown to be a marked effect of elevation and lake influence on length of growing season. "Whereas the five Michigan shore stations at Racine, Milwaukee, Sheboygan, Manitowoc, and Kewaunee show an average season of 171 days, the five highland stations at Darlington, Mt. Horeb, Hillsboro, Hatfield, and Neillsville, lying at corresponding latitudes, average only 130 days. Similarly, the average growing season for Duluth, Superior, Bayfield, and Ashland is 139 days; while the average of the northern highland stations at Solon Springs, Hayward, Butternut, and Vaudesare, though located further to the south, is 95 days. . . .

"The distribution of the rainfall over Wisconsin is remarkably uniform. All but four of the eighty-odd stations show an average yearly rainfall of 28 to 34 in., while the mean for the whole State is 31 in. . . . The local distribution of rainfall varies, however, from year to year, some sections receiving more rainfall one year, and other sections more in other years." In seasonal distribution "Wisconsin is unusually fortunate, since about half of the total rainfall comes in May, June, July, and August, and nearly 70 per cent from April to September, inclusive. June has the heaviest rainfall, averaging 4.1 in., while July averages 4 in. and May 3.9 in. The precipitation during the winter, on the other hand, is slight, December, January, and February each averaging from 1 to 1.5 in. of rain and melted snow. The average rainfall for the State during the winter is 3.9 in., during spring 8.3 in., during summer 11.4 in., and during autumn 7.4 in." There are, however, "many 10-day periods, and frequently 20 days or even more, within which only a fraction of an inch of rain falls." The yearly average of sunshine is about 50 per cent.

The relation of the climate to field crops, particularly corn, sugar beets, small grains, grasses and clovers, potatoes, peas, and tobacco, to the dairy industry, and to fruit growing is discussed in some detail.

Climate and meteorology of Australia (*Off. Yearbook Aust., 5 (1901–1911), pp. 83–115, pls. 4, figs. 5*).—This is a summary in the usual form for the Australian Commonwealth up to the end of 1910.

Evaporation from the Nile at Khartum, R. Türstig (*Met. Ztschr., 29 (1912), No. 10, pp. 454–462*).—The data reported are discussed with special reference to the influence of the wind on the rate of evaporation. The observations were made on tanks floating on the surface of the river, held in fixed position above it, and on land. With a wind velocity of 7 km. (about 4.3 miles) per hour, the evaporation per day (24 hours) was 7 mm.; 16 km., 13.3 mm.; and 50 km., 25 mm.

Preliminary report on the analyses of Montana waters, W. M. Cobleigh, D. B. Swingle, and H. E. Morris (*Montana Sta. Circ. 7, pp. 17–34, fig. 1; Sup., folio, fig. 1*).—This circular is based mainly on analyses of "samples from all the larger cities of the State which are supplied with water from high mountain streams"; well waters from Gallatin, Ravalli, Flathead, Missoula, and Yellowstone counties, and from various points along the Great Northern Railway; and a systematic study of the Yellowstone River. The circular contains special articles on Alkali Water and Human Beings, by C. E. Mollet, and Alkali Water and Domestic Animals, by W. J. Taylor. An automatic still for use on the kitchen range in preparing drinking water from alkali water is described.

Subterranean water, W. M. Watt (*Rhodesia Agr. Jour., 10 (1912), No. 1, pp. 37–40, pls. 7*).—Conditions determining the occurrence and development of underground water supplies are briefly discussed with special reference to Rhodesia.

Solution of silica in underground waters, F. Dienert (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 17, p. 797*).—There was found to be a direct relation between the solution of lime and silica from Loire sand, and a formula for calculating silica from lime in solution is given as follows: $x-y=Ky$ in which x is the increase in lime, y the increase in silica, and K for the Loire sand used in these experiments is 0.063.

Man and water, H. Kraemer et al. (*Der Mensch und die Erde. Berlin, Leipsic, Vienna, Stuttgart, 1912, vol. 9, Der Mensch und das Wasser, pp. XIV+482, pls. 41, figs. 418*).—This is an elaborate discussion, profusely illustrated, of water in mythology and religion, medicine, household, and industry. The

handling of sewage, fresh-water fauna and flora, and fish culture are also discussed.

"Grossmann" process for sewage sludge disposal (*Chem. Trade Jour., 51 (1912), No. 1328, p. 458; Mark Lane Express, 108 (1912), No. 4232, p. 659; Lancet [London], 1912, II, No. 19, pp. 1310, 1311*).—A process adopted by the Borough of Oldham, England, which produces automatically and within a small area dry manure and completely separates the grease and fatty matter from the sludge is briefly described. It is stated that the manure produced by this process is a brown, odorless, and perfectly sterile powder containing about 40 per cent of humus-like matter, "about 2 per cent of ammonia, equal to 8 per cent of sulphate of ammonia with some potash (2.4 per cent) and phosphates (3.5 per cent)." Practical tests of the material on farms are said to have given remarkably good results.

SOILS—FERTILIZERS.

The chemical composition of important American soils, W. O. Robinson (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 213*).—"The results obtained by the analysis of 18 soils and subsoils of important types from New York, Pennsylvania, Virginia, North Carolina, South Carolina, and Alabama have led to the following conclusions:

"(1) Silica is uniformly higher in the surface soil than in the subsoil. Iron, aluminum, and titanium are uniformly higher in the subsoil. In all cases but one manganese had concentrated in the surface soil.

"(2) Of the elements not ordinarily determined, lithium was shown to be present in all cases; caesium and rubidium could not be found. The rare earths were present in all soils; chromium, vanadium, and zirconium were present in all cases and in decided amounts; barium and strontium were present in all cases in determinable amounts; molybdenum was proved to be present in one soil only.

"(3) The sulphur content of soils is much lower than expected. The average of 18 determinations gave 0.044 per cent sulphur. More attention should be given to this element in fertilizer practices."

The distribution of silt and clay particles in soils, R. O. E. Davis and C. C. Fletcher (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 81–84*).—The variations in distribution of silt and clay particles in soils of different regions are correlated with climatic conditions, particularly precipitation.

The composition of the loess soils of the transition region, F. J. Alway (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 11; abs. in Chem. Abs., 6 (1912), No. 21, p. 3146*).—Numerous analyses of loess soil subjected to varying rainfalls are reported and discussed. A very even distribution of mineral constituents was observed to a depth of 6 ft. and with varying rainfall.

Concentration of the soil solution, F. K. Cameron (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 43–48; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 19, p. 941; Chem. Abs., 6 (1912), No. 21, pp. 3146, 3147*).—This is a very brief statement of the fundamental principles of solubility as applied to soil solutions. See also a previous note (E. S. R., 26, p. 122).

The rôle of the lysimeter in soil solution studies, F. K. Cameron (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 49, 50; abs. in Chem. Abs., 6 (1912), No. 21, p. 3147*).—In

this note it is held that lysimeter drainage water is not identical in composition with the soil solution (film water), and that analyses of it can not give direct quantitative information as to the concentration of the soil solution.

The determination of the permeability of soil to water, J. W. LEATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 155–158, pls. 2, fig. 1*).—A machine for packing soils for the determination of permeability in alkali soils is described.

The relative effects on plant growth of (a) sodium carbonate and (b) imperviousness in soils, J. W. LEATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 153, 154; abs. in Chem. Abs., 6* (*1912*), *No. 21, p. 3145*).—Partial neutralization with gypsum of the sodium carbonate of a black alkali soil improved germination and growth, particularly of rice and wheat. The infertility of the soil was apparently due more to the presence of sodium carbonate than to impermeability of the soil.

Biochemical factors in soils, M. X. SULLIVAN (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 305–312*).—This is a summary of work by the Bureau of Soils on the oxidizing and catalyzing power of soils and on organic compounds which may be metabolic products of micro-organisms.

Organic soil constituents in their relation to soil fertility, O. SCHREINER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 231–245*).—This is a brief summary of work by the Bureau of Soils.

Normal and abnormal constituents of soil organic matter, E. C. LATHROP (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 147–151*).—The work of the Bureau of Soils on this subject is briefly summarized.

Effect of histidin and arginin as soil constituents, J. J. SKINNER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 253–264, pl. 1*).—This is a brief summary of work by the Bureau of Soils.

Some constituents of humus, E. C. SHOREY (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 247–252*).—This is a brief summary of work by the Bureau of Soils, most of which has already been noted from other sources.

The plasticity of clay, J. STEWART (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 265–271*).—This article presents evidence to show that the plasticity of clays is due to the presence of humus compounds.

Relation of active phosphoric acid and potash of the soil to pot and field experiments, G. S. FRAPS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 99–102*).—The experiments of which this is a brief account have been noted from other sources (E. S. R., 27, p. 520).

Organic phosphorus in the soil, J. STEWART (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 273–300*).—The article presents data supplementing Bulletin 145 of the Illinois Station (E. S. R., 23, p. 423) and deals mainly with a comparison of methods.

The conclusion is reached that "the Grandeau method is one of the best yet proposed for determining organic phosphorus of the soil. It gives results which are approximately quantitative, and is a useful method when intelligently handled." See also a previous note (E. S. R., 26, p. 814).

A study of soil potassium, B. E. Curry and T. O. Smith (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 51–71, fig. 1; abs. in Chem. Abs., 6* (*1912*), *No. 21, p. 3147*).—In a study of certain New Hampshire soils here briefly reported, it was found that these soils are rich in potash and have a high retentive power for potash applied in soluble form. Certain salts, such as sodium chlorid, sodium nitrate, sodium carbonate, and acid phosphate, increase the solubility of the potash. Calcium carbonate, sulphate, and oxid do not affect it. All potassium salts except the phosphate react with the soil and cause new salts to appear in the solution. In many cases the addition of nitrate of soda alone produced maximum yields.

An agrological study of manganese, P. Nottin (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, p. 207; Compt. Rend. Acad. Sci.* [*Paris*], *155* (*1912*), *No. 23, pp. 1167–1169; abs. in Rev. Sci.* [*Paris*], *50* (*1912*), *II, No. 24, p. 764; Chem. Abs., 6* (*1912*), *No. 21, p. 3151*).—When manganese salts are added to soils they are made insoluble and the manganese is retained as in the case of the absorption of ammonia, potash, and phosphoric acid. The significance of the soil manganese soluble in weak acids is discussed.

The radio-activity of some typical soils of the United States, R. B. Moore (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 187–190*).—Determinations of radio-activity in 12 samples of soils are reported and an attempt is made to correlate this property with chemical composition.

Experiments with reinoculation of steamed soils, T. L. Lyon and J. A. Bizzell (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 159–178, pls. 4; abs. in Jour. Soc. Chem. Indus., 31* (*1912*), *No. 19, p. 941; Chem. Abs., 6* (*1912*), *No. 21, p. 3146*).—"Soils, sterilized by means of steam under pressure, were inoculated with fresh soil and with heated soil, and the mixtures and also the uninoculated steamed soil allowed to stand for different periods before analysis.

"In all cases the water-soluble matter decreased on standing. At first the decrease was most rapid in the soil inoculated with fresh soil, but after six months this sample contained most soluble matter. Nitrate-reducing organisms are apparently an important factor in determining the quantities of nitrates formed. Inoculation does not apparently introduce organisms which lessen ammonia formation. Plants grown on these soils made a better growth at first on the soil inoculated with fresh soil, but did not continue at the same rate. The luxuriance of growth is apparently a function of the rate of disappearance of the soluble matter in the soil. The experiments show considerable variation when repeated with different soils.

"The difference in productiveness is not a matter of available nutrients, but depends on the nature of the toxic matter formed in the soils when steamed. The condition of the organic matter before steaming influences the toxicity of the steamed soil. The rapidity of oxidation in the soil does not always indicate the rate at which toxicity disappears, although aeration of the steamed soil and the growth of plants in it both cause a decrease in toxicity."

The chemical analysis of soil, E. O. Fippin (*New York Cornell Sta. Circ. 12, pp. 4*).—The insufficiency of a chemical analysis unaccompanied by other careful studies for judging the quality of soil, the cost of a chemical analysis, and the unreliability of samples of soil taken by persons untrained in the work, are briefly stated in explanation of the station's policy of not making chemical analyses of miscellaneous samples. Brief suggestions as to methods of soil improvement are also added.

Soil survey of Payne Prairie, Gainesville area, Florida, C. N. MOONEY (*U. S. Dept. Agr., Bur. Soils Circ. 72, pp. 5, fig. 1*).—This circular is a report on the geology and soil types of the area which until recently was under water. The region is considered well adapted for summer grazing. The growth dies in the late fall, however, so that cattle can hardly subsist on it in winter. It is believed that thorough draining would fit the land for the production of general farm crops and a variety of trucking crops as well.

Hardin County soils, C. G. HOPKINS ET AL. (*Illinois Sta. Soil Rpt. 3, pp. 33, pl. 1, figs. 4*).—This is the third of a series of Illinois county soil reports and gives the results of a soil survey, including a soil map of Hardin County, which is representative of the unglaciated area in southern Illinois, including Pope, Johnson, Union, Alexander, Pulaski, and Massac counties and also of the hill lands in the lower Illinoisan glaciation lying between the Ozark hills and the corn belt. The soil formation and types of the region are described and estimates from chemical analyses of the plant-food content per acre of the soil are given, together with the results of fertilizer tests on soils of the county and on similar types in other counties. An appendix discusses the method of the Illinois state soil survey and crop and fertilizer rotations for permanent soil improvement.

The most extensive soil type, covering most of the ordinary hill land, is the yellow silt loam. The fertilizer tests on this type indicated that the organic matter is very inactive and, consequently, that the liberation of nitrogen is slow. "The other upland soils of the county are not much better supplied with nitrogen, and too great emphasis can not be laid upon the importance of growing legume crops, such as alfalfa, clover, cowpeas, and soy beans, which if infected with the proper nitrogen-fixing bacteria have free access to the inexhaustible supply of nitrogen in the air. On the other hand, there are some difficulties to be met and overcome if the most valuable legume crops are to be grown satisfactorily on these lands. Thus, all of these upland soils are markedly sour, and, consequently, they not only contain no limestone, but require applications of that material to correct the acidity present." The only exception in this regard is a small area of yellow, fine sandy loam which is strongly acid in the subsoil but contains small amounts of lime in the surface soil.

Algæ in some Colorado soils, W. W. ROBBINS (*Colorado Sta. Bul. 184, pp. 24–36, pls. 4*).—The author briefly reviews investigations by others on the symbiotic relationship of algæ and bacteria (E. S. R., 15, p. 753; 16, p. 851; 17, p. 22), and reports the isolation, with descriptions and illustrations, of different species of algæ found in Colorado soils with the ultimate view of studying their function as a source of energy for the nitrogen-fixing bacteria, the activities of which, as shown in the work of Headden and of Sackett (E. S. R., 25, pp. 814, 815), has apparently resulted in the excessive accumulation of nitrates in certain of these soils, notwithstanding their low organic matter content.

Algæ were found to occur in many cultivated Colorado soils and soil types, 21 different species being isolated, all of which, with two exceptions, belonged to the blue-green algæ (Cyanophyceæ). There was a predominance of forms possessing thick, gelatinous sheaths, the most prevalent species being *Phormidium tenue*, *Nostoc* spp., *Anabæna* sp., *Nodularia harveyana*, and *Stigonema* sp.

The ammonifying efficiency of certain Colorado soils, W. G. SACKETT (*Colorado Sta. Bul. 184, pp. 3–23, figs. 3*).—In continuation of the work on the fixation of nitrogen in certain Colorado soils (E. S. R., 25, p. 815), the author reports a study of the ammonifying power of these soils, using cotton-seed meal,

dried blood, alfalfa meal, and flaxseed meal as organic substances. The soils were inoculated with soil infusion, adding to each 100-gm. sample 100 mg. of total nitrogen of each of the nitrogenous materials and 10 cc. of the infusion which was prepared from air-dried soil shaken with 200 cc. of sterile distilled water. A comparison of the results with those of other investigators with soils from other localities is also given.

Summarizing the results of these studies, the author concludes that "the power to transform organic nitrogen into ammonia is a property common to many cultivated Colorado soils.

"Soils in the incipient stage of the niter trouble appear to surpass normal soils in ammonifying efficiency.

"Compared with soils from other localities, niter soils excel in ammonifying efficiency to a very marked degree.

"Nineteen of the 31 soils examined have ammonified cotton-seed meal more readily than the other nitrogenous materials employed; the remaining 12 have broken down the dried blood most easily, 26 have formed ammonia from alfalfa meal more readily than from flaxseed meal, and with 5 the reverse has been true.

"The maximum percentage of ammonia produced in 7 days by any soil from 100 mg. of nitrogen as cotton-seed meal was 51.98 per cent, as dried blood 52.64 per cent, as alfalfa meal 34.85 per cent, as flaxseed meal 12.15 per cent."

Peaty swamp lands; sand and alkali soils, C. G. HOPKINS, J. E. READHIMER, and O. S. FISHER (*Illinois Sta. Bul. 157, pp. 94–131, figs. 6*).—The authors report a series of fertilizer experiments on different farms of the peat swamp lands of northern and north-central Illinois, and similar but less extensive tests on the sand ridge soils of the State. Reference is also made to methods of improving the alkali soils in central and northern Illinois.

It is stated that "there are many thousand acres of peaty swamp land in northern Illinois, much of which produces almost no crops because the soil is deficient in the element potassium, although it is rich in all other elements of plant food. . . . The peaty soil varies from almost pure brown peat, containing 80 per cent or more of combustible material, to black muck containing much less organic matter. In some places these soils extend continuously over tracts of considerable size, sometimes over several square miles, to the exclusion of other types of soil; but more commonly the peaty soils occupy irregularly shaped areas scattered about in bodies of land of different kinds. Sandy land is frequently found adjoining or surrounding the tracts of peaty soil, and sand is the most common subsoil found under peaty swamp soils, although a clay subsoil is found in places, and sometimes the peaty soil is underlain at a depth of only a few feet with limestone rock. Occasionally the peaty soil adjoins ordinary Illinois prairie land."

The need of potassium in these soils was indicated in some preliminary field and laboratory tests reported in a previous bulletin (E. S. R., 19, p. 1115). The experiments here reported confirm these results as to the need of potassium. Some kinds of peaty swamp soil may be improved with proper cultivation without the continued use of potassium. In other instances peaty swamp soils, after years of cultivation, resembled the sand ridge soil which is most deficient in the element nitrogen. Applications of nitrogen greatly increased the yield on sand ridge soil. "Certain kinds of farm manure produce fairly good results on some peaty swamp soils, but commonly it is better farm practice to use the manure on other kinds of soil and buy potassium for the peaty swamp soils. . . . While heavy applications of potassium must sometimes be made at first, with proper management only light applications will be required after a few years."

The alkali soils, which are distinct from the peaty swamp soils, occur as spots varying in size from a few square rods to several acres and containing excess of magnesium carbonate. As a rule, the most practical method for improving these soils "is to provide good, deep underdrainage and then plow under organic matter, such as straw, farm manure, green oats, weeds, etc." Applications of calcium sulphate have also been found effective, but whether this remedy can be applied economically has not yet been determined.

Remarks on the theory concerning the action of fertilizers, A. RINDELL (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 209–211; abs. in Chem. Abs., 6* (*1912*), *No. 21, p. 3148*).—It is maintained that the aim of the use of fertilizers "is to yield a nutrient solution of the concentration demanded at the periods of the most lively assimilation."

Increasing the action of cyanamid on the yield of crops under the influence of iron oxid, A. STUTZER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 301–304; abs. in Jour. Soc. Chem. Indus., 31* (*1912*), *No. 19, p. 941; Chem. Abs., 6* (*1912*), *No. 21, p. 3151*).—See a previous note (E. S. R., 26, p. 818).

The fertilizing effect of Palmaer phosphate on peat soils, H. VON FEILITZEN (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 85–90, figs. 2*).—The experiments here briefly reported have already been noted from another source (E. S. R., 26, p. 428).

The use of ground rocks and ground minerals as fertilizers, W. O. ROBINSON and W. H. FRY (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 215, 216; abs. in Jour. Soc. Chem. Indus., 31* (*1912*), *No. 19, p. 942; Chem. Abs., 6* (*1912*), *No. 21, p. 3149*).—"The main points brought out in this paper are: (1) Numerous field and pot experiments hitherto performed have proven that orthoclase and potash mica are not efficient potash fertilizers. (2) At present prices the insoluble potash of orthoclase and muscovite costs more than the soluble potash of the Stassfurt salts. (3) Orthoclase and muscovite are present in American soils in such amounts that any economic application is, figuratively speaking, only a drop in the bucket, and surely can produce no more than proportionate yields."

Field tests with fertilizers, H. A. HUSTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 139–144*).—An attempt is made to show that the associated materials commonly used in fertilizer experiments may increase the available potash in soils, and so result in misleading conclusions as to the need of the soil for potash fertilizers.

The extraction of potash from silicate rocks, W. H. ROSS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 217–229*).—This has already been noted from another source (E. S. R., 27, p. 628).

The salines of the United States as a source of potassium salts, J. W. TURRENTINE (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 319–332*).—Analyses of a large number of the more important salines of the United States do not indicate deposits of potash salts of commercial importance, except possibly in case of the brines from the western desert basins.

Composition of the salines of the United States, J. W. TURRENTINE ET AL. (*Jour. Indus. and Engin. Chem., 4* (*1912*), *Nos. 11, pp. 828–833; 12, pp. 885–889*).—This is a more detailed account of certain of the investigations briefly reported in the article referred to above.

The effect of sodium manures on the percentage of sugar in certain plants, B. L. HARTWELL and P. H. WESSELS (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 129–135; abs. in Chem. Abs., 6 (1912), No. 21, p. 3149*).—Sodium manures decreased the sugar content of mangel-wurzels. They decreased the percentage but increased the total yield of sugar in sugar beets.

The use of aluminum sulphate as a catalytic fertilizer, G. BERTRAND and H. AGULHON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 37*).—This is a very brief abstract of a paper presented at the Eighth International Congress of Applied Chemistry. Small applications (2 mg. per kilogram of soil) of aluminum sulphate produced marked increase in growth of barley and radishes.

The use of boron as a catalytic fertilizer, H. AGULHON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 9; abs. in Chem. Abs., 6 (1912), No. 21, p. 3150*).—In this abstract of a paper presented at the Eighth International Congress of Applied Chemistry it is stated that boron in small amounts has a marked effect on various crops, but especially on Gramineæ. Applications of less than 3 kg. per hectare have proved very beneficial to corn. See also a previous note (E. S. R., 24, p. 721).

The use of manganese as a catayltic fertilizer, G. BERTRAND (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, p. 39; abs. in Chem. Abs., 6 (1912), No. 21, p. 3150*).—In this brief summary of the main results of the author's work on this subject it is shown that manganese sulphate in amounts not exceeding 30 to 50 kg. per hectare has decided value as a fertilizer. See also a previous note (E. S. R., 27, p. 327).

The use of zinc as a catalytic fertilizer, M. JAVILLIER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 145, 146; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 19, p. 942; Chem. Abs., 6 (1912), No. 21, p. 3150*).—Applied at the rate of from 1 to 10 kg. per hectare zinc sulphate was beneficial to corn. The results with other crops were variable.

Commercial fertilizers in 1911–12, G. S. FRAPS (*Texas Sta. Bul. 149, pp. 29, figs. 2*).—This bulletin reports analyses and valuations of fertilizers inspected during the period named, and discusses the terms of the state law under which inspection is made. This law, which went into effect September 1, 1911, provides for the investigation of the composition, properties, and agricultural values of fertilizers. In accordance with its provisions not only inspection but a large number of cooperative experiments with fertilizers in different parts of the State are carried on.

AGRICULTURAL BOTANY.

Introduction to agricultural mycology.—I, Soil bacteriology, A. KOSSOWICZ (*Einführung in die Agrikulturmykologie. I, Bodenbakteriologie. Berlin, 1912, pp. VII+143, figs. 47*).—This book, dealing with the bacteria of the soil, is in four parts, treating respectively of the circulation of the elements concerned in plant life processes as affected by the activity of micro-organisms; soil mycology; the mycology of manures; and the influence of manures on the microflora of the soil. A bibliography and index are appended.

International catalogue of scientific literature. R—Bacteriology (*Internat. Cat. Sci. Lit., 9 (1912), pp. VIII+530*).—This is in continuation of the series previously noted (E. S. R., 25, p. 435). The literature indexed is mainly that of 1908 and 1909, titles of articles on bacteriology (including yeasts and molds) and parasitic protozoology to the number of about 5,600 being listed.

Less than 100 titles of articles that appeared in American publications are included.

The physiology of denitrifying sulphur bacteria, R. LIESKE (*Ber. Deut. Bot. Gesell., 30 (1912), Gen. Versamml. 1, pp. 12–22*).—The results of the author's physiological study of a denitrifying sulphur bacterium may be summarized as follows:

A pure culture was obtained on agar of a bacterium about 1μ in length. The organism was checked in development, but not killed, by direct sunlight. The most favorable temperature for its development was about 30° C. No growth occurred under the full atmospheric pressure of oxygen, but development set in at about $\frac{1}{5}$ to $\frac{1}{8}$ of that pressure and a good growth was obtained in the entire absence of oxygen. While heterotrophy was not observed, development was not checked by addition of organic substances.

Various carbonates and bicarbonates, but apparently not free carbon dioxid, can serve as carbon sources during the growth of the culture. Nitrates are reduced to free nitrogen, but nitrites can not be utilized as a source of nitrates. In the chemosynthetic assimilation of carbon dioxid, sulphur and compounds thereof with hydrogen and sodium can be utilized. With an excess of saltpeter these sulphur compounds are gradually but indirectly oxidized to sulphates. It is thought that this bacterium may play an important rôle in the circulation of sulphur under natural conditions.

Hereditary symbiosis of bacteria and tropical plants, F. C. VON FABER (*Jahrb. Wiss. Bot. [Pringsheim], 51 (1912), No. 3, pp. 285–375, figs. 7*).—The author studied the phenomena of hereditary symbiosis between bacteria and higher plants independently of Miehe, whose work (E. S. R., 26, p. 545) he mentions. Some of his main conclusions may be stated as follows:

It seems that in certain cases there exists a relation of mutual advantage between the higher plant and its hereditary inhabitant. In some instances of hereditary transmission through seed or growing point it is not yet quite clear that the case is not one of simple epiphytism. In some such cases the later invasion by the micro-organism of other parts of the plant was followed by parasitic attack, this being soon followed in turn by apparent symbiosis. These alterations in physiological relations illustrate the difficulty of drawing a sharp line between symbiosis and parasitism.

Outside the bacterial cases, hereditary symbiosis is alleged in regard to various other lower forms. An extensive bibliography is given.

Utilization of nitrogen in air by plants, IV, T. JAMIESON (*Agr. Research Assoc. [Scot.] Rpt. 1911, pp. 40, pl. 1*).—This is a final report by the author in which he defends his theory regarding the assimilation of nitrogen by plants through special trichomes (E. S. R., 18, p. 125).

The fixing of elementary nitrogen by yeasts, Monilia, and Oïdium, A. KOSSOWICZ (*Ztschr. Gärungsphysiol., 1 (1912), No. 3, pp. 253–255*).—Studies are reported of cultures made with a number of species of Saccharomyces and with *M. candida* and *O. lactis* to determine their ability to fix atmospheric nitrogen. The results of the investigation show that not only the Saccharomycetes but also Monilia and Oïdium are able to assimilate nitrogen from the air.

The assimilation of nucleinic nitrogen and phosphorus by lower algæ, E. C. TEODORESCO (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 300–303*).—The author, studying *Chlamydomonas reticulata* in media having nitrogen and phosphorus in nucleinic or nonnucleinic form or lacking one or both of those elements, found that the most flourishing cultures were obtained only in the medium first named and that from these cultures a considerable quantity of mineral phosphorus could be obtained, the amount increasing with age. From these facts the conclusion is drawn that certain lower algæ are able to

break up the molecule of nucleinic acid, possibly by the agency of a specific ferment; also that nucleinic nitrogen and phosphorus are able to serve as nutriment for such algæ, and are more favorable to rapid development than the mineral forms of these elements.

Hydrocyanic acid in plants.—I, Its distribution in the Australian flora, J. M. PETRIE (*Proc. Linn. Soc. N. S. Wales, 37 (1912), pt. 1, pp. 220–234*).—An examination was made of a large number of Australian plants to determine the presence of hydrocyanic acid, the sodium picrate method of Guignard being the test used. Parts of plants were cut up, steeped in water for 24 hours at 40° C., and tested with the addition of emulsin, a solution of amygdalin, or alone.

Of 300 native plants, representing 65 natural orders, 29 species gave positive results in which hydrocyanic acid was liberated by the natural ferment in the plant. Seven exotic species were also recorded as containing cyanogenetic glucosids.

The present paper does not include studies on grasses.

On the presence of free hydrocyanic acid in plants, III, C. RAVENNA and G. BOSINELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 6, pp. 355–358*).—The authors, in tests made for hydrocyanic acid employing methods previously noted (E. S. R., 27, p. 635), found that cherry laurel leaves killed at 110° gave a negative or a less marked reaction than did those killed at 100°. This fact is thought to support the views that in ordinary testing methods the enzyms have time to form an appreciable quantity of hydrocyanic acid before being destroyed, and that this acid is ordinarily present in these leaves only in glucosid combination. It is thought that the weak or negative reactions observed in case of *Phaseolus lunatus* may indicate here a limited breaking up of the glucosid. Negative results obtained in case of almonds are taken to indicate that free hydrocyanic acid is not met with in this plant during its germination.

The presence of hydrocyanic acid in white clover, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 15, pp. 651–653*).—The author reports the presence of hydrocyanic acid in white clover (*Trifolium repens*), considerable variation being shown in specimens obtained from different localities.

The formation of anthocyanic pigments in leaves following the annular decortication of the stems, R. COMBES (*Ann. Sci. Nat. Bot., 9. ser., 16 (1912), No. 1–3, pp. 1–53*).—A detailed account is given of investigations the principal results of which have been noted elsewhere (E. S. R., 21, p. 628).

The author finds that often the reddening of leaves and branches follows ringing and that the leaves and branches showing an increased amount of anthocyanin have a greater dry weight and less ash and water than normal ones. The excess seems to be largely made up of carbohydrates. He claims there is a direct connection between the accumulated soluble carbohydrates and the red pigment.

On the mode of formation of pigments in roots of carrots, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 6, pp. 411–414*).—The author reports that the elaboration of the pigment in carrot roots has two phases. In the first, mitochondria differentiate into leucoplasts, each of which gives up part of its substance to elaborate a grain of starch. In the second, the leucoplast recovers itself, forming interiorly a pigment in form more or less clearly crystalline, while the starch grain is slowly resorbed, after which the chromoplast disappears almost wholly. The process is said to resemble closely the elaboration of pigments in certain animal cells.

Some responses to color stimuli by certain plants, G. W. HOOD (*Ann. Rpt. Columbus Hort. Soc., 1910, pp. 147–166, figs. 7*).—The author describes experiments to determine the effect the various colors or combinations of colors of

the solar spectrum have on plant life. Colored glass was used in the experiments and as pure colors as possible were obtained. The relation of the color of the glass to temperature, the light intensities, and the spectroscopic readings of the different glasses are given, after which the effects on 14 different species and varieties of plants are described.

It was found that certain colors had marked effect on some plants and scarcely any on others, also that at different times in the growth of a given species one color stimulated the plants to a more rapid growth than it did at other times.

The absorption of ultraviolet rays by chlorophyll, C. DHÉRÉ and W. DE ROGOWSKI (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 15, pp. 653–656, figs. 2*).—Studies were made of the absorption by chlorophylls α and β extracted from *Taxus baccata* and comparisons made with crystallized chlorophyll.

It was found that the pure chlorophyll was remarkably transparent, so far as the ultraviolet rays were concerned. The natural chlorophylls, however, in ether solution had a common absorption band of ultraviolet rays which was about the middle of that portion of the spectrum.

An improved insolator, V. VOUK (*Ber. Deut. Bot. Gesell., 30 (1912), No. 7, pp. 391–394, fig. 1*).—A description is given of an improved device for measuring the chemical intensity of light. It is said to be simple and adapted to experimentation in plant physiology and to other purposes.

A schematic representation of the water relations of plants, B. E. LIVINGSTON (*Plant World, 15 (1912), No. 9, pp. 214–218*).—An outline is presented which attempts to show the main factors which appear to determine the moisture conditions in the active parts of the ordinary rooted plant.

Studies on the movement of colloids through living cell membranes, W. RUHLAND (*Jahrb. Wiss. Bot. [Pringsheim], 51 (1912), No. 3, pp. 376–431*).—The author reports on his investigations made with about 30 basic and 89 acid coloring matters as to their ability to pass through cell membranes of *Allium cepa*, Spirogyra, and *Vicia faba*. The solutions are arranged in the order of rapidity of their admission into the cell. The reasons for the different permeabilities observed are discussed and arguments presented for a regulatory control of protoplasm.

The acidity of cell membranes, A. WIELER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 7, pp. 394–406*).—Following up the conclusions of A. Baumann and E. Gully (E. S. R., 23, p. 715), the author, in order to test the applicability of this view to higher plants, investigated needles of pine; leaves of red beech, American oak, horse chestnut, grape, yellow lupine, and oats; fiber of cotton and flax; and cellulose from conifers.

All of these showed acid reaction regardless of their condition or age when taken. Electrical conductivity, however, was deficient or lacking. Further investigations were thought to show that the apparently acid character was due to the properties of colloid substances in the cell membranes, as claimed by Baumann and others in case of peat moss. The question is raised as to the relation of the composition of these higher plants to that of peat moss on the same soil.

Some chemical relations of plant and soil, W. J. V. OSTERHOUT (*Science, n. ser., 36 (1912), No. 931, pp. 571–576*).—This is an address delivered by the author before Section G of the American Association for the Advancement of Science, in which he briefly outlines some of the relations between plants and soils, discussing the chemical effects of soil substances on the plant under the heads of toxic, stimulatory, nutrient, and protective action. He concludes that the mechanism of antagonism consists primarily in hindering the penetration of toxic substances.

Recent studies on the chemistry of carbon dioxid assimilation, V. GRAFE (*Monatsh. Landw., 5 (1912), No. 7, pp. 203–213, figs. 3*).—In continuation of a series of discussions (E. S. R., 25, p. 522), a review is given of various studies and views on the rôle played by carbon dioxid and formaldehyde in the growth of plants. It appears that in those plants in which growth is markedly favored by formaldehyde relatively little starch is formed, while reducing sugar is considerably increased. The possible relation of the observed facts to the interests of the plant in the struggle for space, air, and sunshine in early spring is briefly discussed.

The influence of cobalt and vanadium salts on vegetative growth, E. H. DUCLOUX and MARÍA L. COBANERA (*Rev. Mus. La Plata, 18 (1911–12), pp. 145–163, figs. 15*).—The results are given of a number of experiments with salts of cobalt, vanadium, and uranium added to Knop's solution in order to ascertain the stimulating influence of very dilute solutions of these salts on the development of *Pisum sativum*. These investigations are said to be preliminary to a study of the effect of stronger solutions of these salts on the development of plants.

The results as exhibited appear to indicate that whatever stimulating effect appears is slight and is confined almost exclusively to the leaves. The effect on the roots is depressing, as a rule, and is in some cases considerable. In some instances the leaves at the close of the experiment showed the presence of traces of cobalt, vanadium, or uranium as a storage product.

Influence of salts of potassium on the resistance of plants to freezing, C. DUSSERRE (*Bul. Soc. Vaud. Sci. Nat., 5. ser., 48 (1912), No. 176, pp. 393–395*).—Attention is called to the difference in resistance to frost injury of 2 varieties of grapes which were grown in a series of fertilizer plats. Each variety was grown with and without potash salts, and those which had received potash were less injured by severe frosts in 1909 and 1912 than the same varieties which had not received this fertilizer. Analyses were made of shoots taken from the different plats, which showed a lower water content and a somewhat higher dry matter and ash content where potash had been given to the plants. The difference in resistance is believed to be due to a difference in concentration of the cell sap within the buds. Similar results were noted on 2 plats of grapevines, one of which had received nitrate of soda and the other was without fertilizer.

The tarring of roads, HICKEL (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 7, pp. 605, 606, 626–628*).—This author gives a résumé of the present state of knowledge and of opinion in regard to the influence of tarred roads on neighboring vegetation, mentioning the work of various investigators in this connection.

An investigation of the seedling structure in the Leguminosæ, R. H. COMPTON (*Jour. Linn. Soc. [London], Bot., 41 (1912), No. 279, pp. 122, pls. 9*).—This paper gives a detailed description of the anatomical features exhibited in the transition region of a number of species of Leguminosæ, together with a classified summary of the information at present available on the chief anatomical characters of leguminous seedlings and a general discussion of the relations between seedling anatomy and other vegetative features.

The opening of indehiscent fruits during germination, A. JOXE (*Ann. Sci. Nat. Bot., 9. ser., 15 (1912), No. 5–6, pp. 257–375, figs. 52*).—In a study made of a large number of indehiscent fruits it was found that their opening during germination was in most cases through regular channels. This splitting of the fruit constitutes a sort of delayed dehiscence. The rupture of the pericarp is said to be due almost entirely to an increase in the volume of the embryo during germination. The anatomical structures related to dehiscence and the position of the lines of dehiscence in reference to their morphological characters are discussed.

The elongation of the hypocotyl, B. D. HALSTED (*New Jersey Stas. Bul. 245, pp. 32, pls. 12, figs. 6*).—This bulletin is introductory to the study of the elongation of the hypocotyl in its relation to successive generations of offspring secured through selection and breeding.

Tests were made of the length of the hypocotyl in beans, radish, cowpeas, turnip, tomatoes, sunflower, etc., and it was found that the average length of the hypocotyl varies greatly in different species and among the varieties of the same species. Hybrids and crosses vary greatly in the lengths of their hypocotyl between those of their parents. It was found that the offspring of different plants of selfed species have hypocotyls that do not show the same averages. The degree of maturity of the seed, mutilation of the embryo, and size of the seed were found to influence the length of the hypocotyl. In addition external factors, such as depth of planting, compactness of soil, distance apart of seedlings, change of position of seedlings, moisture of the soil, moisture of the atmosphere, light, and temperature are influencing factors in determining the development of this part of the plant.

The periodicity of tropical plants, G. KLEBS (*Biol. Centbl., 32 (1912), No. 5, pp. 257–285; abs. in Ztschr. Bot., 4 (1912), No. 9, pp. 643–650*).—Pursuant to studies previously noted (E. S. R., 27, p. 522), the author gives an account of investigations made by him with a view to ascertaining (1) whether the growth of tropical plants is on the whole periodic and (2) whether the periodicity so far as observed in the Tropics is a constant character or is capable of being modified by varying the conditions. Investigations were made with 24 species of plants on growth, leaf fall, and related phenomena, varying in length for different species from 46 to 83 days.

In a number of tropical species leaf fall apparently occurs nonperiodically, but some cases become periodic when they are old. Some plants were observed to cast their leaves in apparent response to alterations of environment at a time when they would not normally do so at that place. One species, according to variations of nourishment, casts its leaves either all at once or only gradually through a long period. The author considers the question of the plant's relations with the outer world as too fundamental to be considered as settled by any investigations yet made.

Leaf fall and leaf removal in the Tropics, G. VOLKENS (*Laubfall und Lauberneuerung in den Tropen. Berlin, 1912, pp. 142; rev. in Ztschr. Bot., 4 (1912), No. 9, pp. 643–650*).—This is a report of an extended study on periodicity in plants made in Java, Ceylon, and elsewhere. Observations were made on a large number of trees representing widely separated regions, and the results are recorded in detail.

At Buitenzorg in case of some deciduous trees, the cycle of change embraced the whole year; in others it was completed in the dry season and again in the wet season of the same year, little difference appearing between the two cycles; in still others little or no regularity or relation to seasons could be affirmed. No general connection was regarded as established between leaf fall and climate at that place. The results at Ceylon and elsewhere were also inconclusive.

Parallel mutations in Œnothera biennis, R. R. GATES (*Nature [London], 89 (1912), No. 2235, pp. 659, 660*).—A brief description is given of a series of forms which have been cultivated from a strain of *Œ. biennis* obtained from the Madrid Botanical Garden. These forms seem to constitute a parallel series of the well-known mutants from *Œ. lamarckiana*. Some of the mutants in leaf characters agree with those described under the names *Œ. lœvifolia*, *Œ. lata*, and possibly one corresponding to *Œ. gigas*.

The origin of Œnothera gigas, T. J. STOMPS (*Ber. Deut. Bot. Gesell., 30 (1912), No. 7, pp. 406–416*).—The author reports finding what is claimed to be a "half mutant" of *Œ. lamarckiana*, having 21 chromosomes, the mutant *Œ. gigas* having 28, double the number ascribed to the parent. To this alleged new form, the author has given the name *Œ. lamarckiana semigigas*.

FIELD CROPS.

Suggestions to the dry farmer, edited by F. S. COOLEY (*Montana Sta. Circ. 19, pp. 52, figs. 26*).—This circular discusses rainfall, loss of water, management and moisture requirements of crops, and tillage in their relation to dry farming. The data presented are compiled from publications of the station and from other sources. A list of publications on dry farming, or on topics pertaining to the subject, is given.

Forage crops for the cotton region, S. M. TRACY (*U. S. Dept. Agr., Farmers' Bul. 509, pp. 47*).—This bulletin treats of the most important forage crops adapted to the various sections of the cotton region. Six different soil regions are described with particular reference to forage crop culture, and discussions are presented on hay crops and hay-making, pastures, and silage and soiling crops. Twenty-one grasses, 13 leguminous plants, and 6 miscellaneous forage crops are noted individually.

Crop rotation for northern Wisconsin, E. J. DELWICHE (*Wisconsin Sta. Bul. 222, pp. 3–19, figs. 14*).—This bulletin suggests systems of crop rotation which seem best adapted to the existing agricultural conditions in the northern half of Wisconsin. The different systems suggested are outlined graphically and discussed with reference to their value for various types of farming. The rotations included in the discussion are a 3-year rotation for dairy farms, 4-year rotations with clover and timothy, with peas for grain farming, and with peas as a cash crop for dairy farming, a 5-year rotation with alfalfa for dairy farming, a 5-year rotation for heavy soils, clover-seed rotations of different duration, and a rotation for garden and root crops. Notes are given on the place of potatoes in the rotation and on the methods of arranging fields.

County experiment farms in Ohio, C. E. THORNE, C. G. WILLIAMS, and C. MCINTIRE (*Ohio Sta. Bul. 241, pp. 513–549, figs. 3*).—This bulletin describes the organization of county experiment farms in Ohio, together with their work in 1911. Such farms are reported in operation in the counties of Paulding, Miami, Clermont, Hamilton, and Hancock. The proposed plan of management for each farm is outlined and some of the results secured in fertilizer and variety tests are recorded. In all instances the work had not been in progress long enough to warrant conclusions. Suggestions as to the requirements of a county experiment farm are offered, and the act providing for the establishment of these farms is reproduced.

Agricultural studies in America, A. HÖNNINGSTAD (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1911, IV, pp. 19–114, figs. 9*).—This article is a report on a visit to the United States and Canada in 1911 for the purpose of studying methods of experimentation relating to agronomy and allied subjects.

Experiments with wind-breaks, 1909–1911, N. ESBJERG (*Ber. Ribe Amts Landbofor. Havebr. og Husmands., 1911, pp. 3–20*).—Experiments similar to previous work (E. S. R., 23, p. 435), were conducted with rye, mangels, clover and grass, and potatoes.

The results showed that shelter had a very beneficial influence on the growth and yield of field crops. It is estimated that the value of the increase in the yields per töndeland (1.36 acres), due to a systematic planting of hedges in

the fields, amounted to 10 crowns ($2.70), when the loss of field area and the expense of planting and maintaining the hedges are considered.

Influence of precipitation and temperature on the yields of cereals in the governments of Saratov, Samara, and Tambov, S. KHARIZOMENOV (*Sclsk. Khoz. Viestnik Jugo-Vostoka, 1911, No. 4–6; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, pp. 927, 928*).—Tables are given presenting data covering a period of 25 years and showing the relation of precipitation and temperature to the yields of cereals, hay, and potatoes.

It is concluded from the data at hand that the yield of these crops increases with the increase in the total precipitation from November to March, inclusive, and that all cereal crops further respond in yield to a high precipitation during the months of November, March, May, and June. The summer cereals apparently fell in yield with the increase of rain during August, September, October, and April. The rains during these months are considered as useful only in promoting the growth of winter cereals and of perennial grasses.

Market hay, H. B. MCCLURE (*U. S. Dept. Agr., Farmers' Bul. 508, pp. 38, figs. 3*).—This bulletin presents a general review of the hay trade in this country and discusses more in particular the different grades of market hay and methods of baling, shipping, and marketing hay, together with market conditions and requirements. A system of hay grades in use in the principal market centers is outlined, and a table is given setting forth the requirements of the various eastern, western, and southern hay markets, and showing the kinds of hay received, types of bales, methods of inspection and weighing, and the most common faults affecting the selling price.

Further experiments on the economic value of root crops for New York, E. R. MINNS (*New York Cornell Sta. Bul. 317, pp. 547–566, figs. 8*).—Previous work with root crops (E. S. R., 19, pp. 136, 137; 21, p. 426; 22, p. 76) is reviewed, and the results of further experiments in the production of mangels and of silage corn from 1908 to 1911, inclusive, are reported.

The average results for 3 consecutive years show a yield of 17.93 tons per acre and 13.27 per cent of dry matter for half-sugar mangel, and a yield of 17.75 tons per acre and 13.31 per cent of dry matter for the Long Red mangel.

A comparison of corn and mangels as to yield and cost of production was made with Pride of the North corn and with half-sugar mangels. The average results for the 4 years show a yield of 10.80 tons per acre and a cost of 71 cts. per hundred pounds of dry matter for corn, and a yield of 20.14 tons per acre and a cost per hundred pounds of dry matter of $1.54 for half-sugar mangels. Observations on the relation of weather to the production of dry matter showed that the mangels were less dependent on rainfall and temperature than on soil conditions for the production of dry matter, while the corn crops seemed to conform closely to the variation in temperature and rainfall during the 5 months of the growing season. The average acre production of nutrients, as shown by analyses, was 5,705.6 lbs. of dry matter, 574.1 lbs. of protein, 170.2 lbs. of fat, 3,656.6 lbs. of carbohydrates, 991.5 lbs. of crude fiber, and 313.2 lbs. of ash for the corn, and 5,023.2 lbs. of dry matter, 607.6 lbs. of crude protein, 20.7 lbs. of fat, 3,701.9 lbs. of carbohydrates, 301.4 lbs. of crude fiber, and 391.6 lbs. of ash for the mangels.

In cooperative experiments similar to those conducted at the station, the cost in labor and fertilizers of a ton of mangels was nearly twice as great as the cost of a ton of corn fodder. The experiments at the station in 1910 showed a cost of production per acre of $41.90 for corn and of $76.88 for mangels, and in 1911 a cost of $45.51 for corn and of $78.65 for mangels. The results with mangels and corn obtained at the Cornell, Pennsylvania, Michigan, Indiana,

and Minnesota stations are also summarized in tabular form. Brief directions are given for growing mangels, carrots, ruta-bagas, and turnips.

Alfalfa.—The relation of type to hardiness, P. K. BLINN (*Colorado Sta. Bul. 181, pp. 3–16, figs. 14*).—Continuing previous work (E. S. R., 26, p. 633), this bulletin gives an account of the alfalfa work at the Colorado Station leading up to and including the discovery of a hardy type "characterized by a more spreading crown, with numerous buds and shoots springing from the crown below the surface of the soil. These underground shoots in some of the best plants of this type have been found several inches below the surface of the soil. The bud area in this type of plant is thus protected by the soil from drying or freezing."

Importance of alfalfa as a Wisconsin forage plant, R. A. MOORE (*Wisconsin Sta. Circ. Inform. 35, pp. 16, figs. 8*).—This circular presents statistical and historical notes on the culture of alfalfa in Wisconsin and discusses in a popular manner the value and culture of the crop in the State. A comparison of grain feeds with alfalfa hay, and a comparison of the yields of green substance, hay, protein, dry matter, and fat of alfalfa, clover, timothy, and brome grass are shown in tables. The cultural directions given have a special bearing on seed-bed preparation, soil inoculation, seeding, and harvesting. Notes are also given on alfalfa as a soiling and a pasture crop.

Southern bur clover, E. F. CAUTHEN (*Alabama Col. Sta. Bul. 165, pp. 163–176, figs. 7*).—This bulletin discusses in a popular manner the culture and uses of bur clover, and in this connection reports as the result of 2 experiments an average yield of 3,493 lbs. of hay per acre from bur clover grown alone, and a yield of 5,520 lbs. of hay from a mixture of bur and crimson clover and oats. The following composition of bur clover hay is recorded: Water 7.59, crude fat 4.22, crude protein 19.50, crude fiber 25.70, and ash 9.89 per cent.

Condition of seed corn in West Virginia and how to test it, I. S. COOK, Jr. (*West Virginia Sta. Circ. 5, pp. 4, fig. 1*).—Directions for testing the germination of seed corn are given.

Fertilizing and irrigating cotton in 1910 at the Turkestan Experiment Station, R. R. SHREDER (*Turkest. Selsk. Khoz., 1911, Apr.; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, p. 862*).—The results of irrigation experiments showed that 4 applications of water increased the yield by about 620 lbs. per acre as compared with 3 applications. With additional applications the increase in yield diminished and with 7 applications the yield began to decrease.

In the fertilizer experiments, barnyard manure gave higher yields than commercial fertilizers, which ranked in decreasing order of increase in yield as follows: Cotton-seed cake, bone meal, blood meal and superphosphate, and nitrate and superphosphate.

Flax growing in Montana, F. S. COOLEY and M. L. WILSON (*Montana Sta. Circ. 15, pp. 95–100, 102–113, figs. 3*).—After presenting certain statistics on flax growing in Montana and the neighboring States, this circular discusses flax culture in a general way with reference to Montana conditions. Notes are given on soils adapted to the culture of the crop, time, rate, and depth of seeding, varieties, seed treatment and diseases, tillage, harvesting and thrashing, the use and value of the straw, cost of production, and the effect of the crop on the land.

Counts were made of an average sample of Brown Russian flaxseed which showed 81,648 seeds in 1 lb.

Commercial varieties of potatoes for Wisconsin, J. G. MILWARD (*Wisconsin Sta. Bul. 225, pp. 3–22, pls. 3, figs. 3*).—This bulletin discusses the value of growing pure varieties in raising or maintaining high market standards, and

gives descriptions with illustrations of a number of standard varieties. The leading standard late varieties recommended for Wisconsin are the Rural New Yorker, Burbank, Carman No. 3, and Peerless, and the leading standard early varieties Early Ohio, Early Rose, and Triumph.

The influence of the soil on the characteristics of potatoes, systems of potato farming, and running out of varieties are discussed and recommendations for improvement are given. Rules for potato exhibitions are laid down and a potato-judging score card is outlined.

Experiments with varieties of rye, E. W. LJUNG (*Sveriges Utsädesför. Tidskr., 22 (1912), Nos. 2, pp. 119–141; 3, pp. 177–200*).—A summary is given of experiments with 24 varieties of rye conducted since 1887 at Svalöf and 4 other stations. The Svalöf rye No. 0301, which is a Petkus strain, gave the largest yields of grain and also a large yield of straw. The different varieties are described.

Variety tests with rye, 1905–1910, K. HANSEN and M. L. MORTENSEN (*Tidsskr. Landbr. Planteavl, 19 (1912), No. 2, pp. 229–304*).—These tests, conducted at 4 different experiment stations, were carried on mainly for the purpose of determining the value of Brattingsborg, Petkus, Heinrich, and Probstei rye for Danish agriculture. On loamy soils Petkus ranked first in average yield, followed by Brattingsborg and Heinrich in the order mentioned, while on sandy soils Brattingsborg produced the highest average yield, with Petkus ranking second and Heinrich third. In stiffness of straw Heinrich ranked first in all tests and the straw of the Petkus variety was stiffer than that of the Brattingsborg rye.

Rye culture and rye improvement, E. W. LJUNG (*Sveriges Utsädesför. Tidskr., 22 (1912), No. 4, pp. 231–241*).—This article discusses the general phases of rye culture and rye improvement with particular reference to the work as carried on at Svalöf.

Experiments on the cultivation of sugar beets for the years 1902–1909, edited by S. L. FRANKFURT (*Trudy Sĉeti Opytn. Poleĭ Vseross. Obshch. Sakh. Zavod., Soobshch. 12, 1911; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 5, pp. 730–738*).—A summary of the results of various fertilizer and culture experiments with sugar beets is presented.

It was found that plowing land to a depth of 10½ in. appeared to be sufficient for sugar beets and that increasing the depth from 8 to 10½ in. yielded but a slight increase. In the fertilizer experiments the relative effect of manure was greater when used at the rate of about 6.7 tons per acre than when 16.75 tons were applied. When mineral fertilizers were applied with the manure the same yields of winter cereals and sugar beets were secured from the light and the heavy applications.

Deterioration in the quality of sugar beets due to nitrates formed in the soil, W. P. HEADDEN (*Colorado Sta. Bul. 183, pp. 3–184, figs. 7*).—The experiments here reported were conducted in continuation of previous investigations on the occurrence of nitrates in Colorado soils in quantities prejudicial to the culture of different crops (E. S. R., 25, p. 814). The object of the work described in the present bulletin was the study of the relation of an undue or untimely supply of nitrates to the quality of the sugar beets grown in some sections of the State and the determination of whether the observed depreciation in the quality of beets is the result of a widespread and excessive supply of nitrates in the soil. Studies are also reported of the influence of alkali, seepage, possible lack or improper ratio of the elements of plant food, leaf spot, and climatic conditions.

Observations made on sugar beets grown 4 years in succession on strongly alkalized land indicated that the alkali in itself was not detrimental to the

quality of the beets, did not affect their content of dry matter, and slightly increased the quantity of ash without affecting its composition sufficiently to appear definitely of consequence.

It is reported that no serious effects on yield and quality were observed as due to the height of the water plane, which, during the 4 years on portions of the land under experiment, never fell below 4 ft. and was less than 3 ft. below the surface for a good portion of the growing season. These observations were repeated many times with the same results and it is concluded that alkali and seepage are not prevalent enough to regard them as the cause of the depreciation of the general crop of sugar beets.

For the purpose of determining the influence of a lack of plant food or of the relative quantities of plant food elements, experiments with different fertilizers in various combinations were made in 1909 and 1910 on soils sampled to a depth of 3 ft. and showing a great abundance of both phosphoric acid and potash. The application of nitrogen either in the form of sodium nitrate or manure, the dung of cattle fed on alfalfa hay, beet pulp, molasses, and straw to which grain was added during the final stages of feeding, had no definite effect on the yield of sugar. In this whole series the sugar was low and the results were regarded as showing that the poor quality was not due to any lack of plant food.

To establish the effects of leaf spot on yield and sugar content determinations were made in 127 cases, including some lots badly affected with the disease. The results obtained did not show any constant or definite relation between the severity of the attack and the yield and percentage of sugar. Samples from fields severely affected by leaf spot contained from 16 to 17 per cent of sugar.

A series of experiments was begun to ascertain whether beets grown with known excessive quantities of nitrates possess in general the qualities and composition of the beet crops under consideration. In 1910 from 250 to 1,250 lbs. of nitrate of soda per acre in portions of 250 lbs. were applied on 5 plats, the sixth plat in the series receiving no nitrate. These plats were laid out on good, choice ground. The first application was made 2 days before the seed was planted and the succeeding ones at intervals of 4 weeks up to July 27, the date of the last application. Another series of experiments was made with superphosphate, potassium chlorid, and sodium chlorid on a piece of bad ground planted to beets, to observe the effect of these fertilizers on the ripening and the composition of the crop. As standards of comparison for quality and composition samples from Montana, Michigan, and Colorado were selected. The series of samples analyzed included beets from the Arkansas Valley grown on good soils without fertilizers, with various fertilizers, and with various quantities of nitrates alone, on soil in which large quantities of nitrates had developed, and on nitrate land with the application of phosphoric acid, potash, and nitrate of soda, together with beets produced at the station with and without the application of nitrates in 1910 and 1911, respectively. The factors considered in their relation to the quality of the beets were nitric nitrogen, phosphoric acid, injurious ash, injurious nitrogen, ratio of proteid nitrogen to total nitrogen, especially in the juice, and percentage of sugar. The results of this work indicated that beets grown on good Colorado soils may be either good or very poor in quality. The belief is expressed that the beets even when produced under the best conditions contain a rather large amount of ash, specifically of injurious ash, and that the high percentage of nitrogen present in the form of nitrates indicates the cause of the lack in quality when conditions otherwise have been favorable.

The beets grown with fertilizers presented in general a low percentage of sugar, a high percentage of pure ash with a low percentage of phosphoric acid, and a high content of injurious ash and injurious nitrogen, together with a high percentage of nitric nitrogen. Since the use of fertilizers did not ameliorate conditions, the results are regarded as indicating an adequate supply of the different plant food elements in the soil and as suggesting a too liberal or an untimely supply of nitrates.

The crops grown on the choice piece of land with various quantities of nitrates alone showed that while the application of 250 lbs. had been decidedly beneficial, the larger applications had depressed the percentage of sugar from 16.5 per cent to 11 per cent, with an increase of 58 per cent in pure ash and of over 100 per cent in total nitrogen. The nitric nitrogen was increased from 10 to 63 fold and the ratio of the proteid to the total nitrogen was depressed from 31 to 16.5 per cent and the phosphoric acid from 0.038 to 0.024 per cent. The results secured with 250 lbs. of nitrate as compared with Montana beets grown with 200 lbs. per acre showed that the Colorado beets were low in phosphoric acid, had a low ratio of proteid nitrogen to total nitrogen, and contained nitric nitrogen which was absent in the Montana sample. It was also found that the larger quantities of nitrate had increased the chlorin and the sodium oxid. Attention is called to the fact that these points persist through the series of beets grown with the application of fertilizers and that they characterize the poor beets grown on good soil. The real coefficient of purity of the thick juice of the beets grown with the different quantities of nitrate was found to be 87.91 for 250 lbs., 88.3 for 500 lbs., 88.6 for 750 lbs., 86.37 for 1,000 lbs., and 86.43 for 1,250 lbs. of nitrate per acre. It is pointed out that a depression of the real coefficient of purity of the thick juice of 1.93 points, as was the case here, signifies a great decrease in the amount of granulated sugar obtained in the first crystallization.

A study was also made of the beets grown on bad soil, or one containing an average of 1.15 per cent of potash, 0.146 per cent of phosphoric acid, and 0.108 per cent of total nitrogen. The ratio of the nitric to the total nitrogen was 19 per cent in the first or upper 2 in. of the worst, and 3.5 per cent in the second 2 in. of the best portion of the field. In parts per million of the soil the nitric nitrogen ranged from 30 parts in the best to 280 parts in the worst soil samples taken from this area. The analyses of the beets produced on this land gave results in general the same as those obtained in the experiments with nitrate of soda, but they were much more pronounced although not at all in proportion to the amount by which the nitric acid in the soil exceeded the amount applied in the experiments. The beets fertilized with phosphoric acid in these experiments were very low in quality, and this result did not agree with the results secured by the use of superphosphate alone in the fertilizer experiment but rather with the results obtained from its use in conjunction with the nitrate. The real coefficient of purity of the thick juice from the beets grown on the bad land was 69.56 and the nitric nitrogen in this juice ranged from 0.05 to 0.49 per cent.

In another series of experiments conducted for the purpose of studying the effect of an abundant supply of nitrates during August and September, 750 lbs. of nitrate of soda was applied in 4 applications from August 4 to September 28, inclusive. The results in this case showed an increase in the average weight of the beets and tops, a decrease in the percentage of sugar and dry matter, a slight increase in the pure ash, a decrease of about 2 per cent in the phosphoric acid of the pure ash, an increase in the phosphoric acid of the ash of the leaves, an increase of about 100 per cent in the nitric nitrogen, and a depression of the ratio of proteid to total nitrogen.

With the assumption that the effect of leaf spot upon the yield and quality of the beets is due wholly to the destruction of the foliage, an effort was made to imitate this action by defoliating the beets rather late in the season to determine the kind of changes produced in the quality. It was shown that without question the destruction of the leaves even as late as September 1 had an injurious effect, but that the composition of the beets was quite different from that of the poor beets produced in the Arkansas Valley even on good ground, which have the composition and qualities of beets grown with an excessive supply of nitrates.

The conclusion drawn from these various lines of investigation is that the increased production of nitric nitrogen in the irrigated soils over large sections in Colorado is the chief cause in the deterioration of the sugar beets produced.

[Chemical composition of Russian tobaccos], A. Kliûcharev (*Selsk. Khoz. i Lîesov., 233 (1910), July, pp. 573–583; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 5, p. 747*).—It is reported from the results of analyses that Crimean tobaccos contained 2.864, Transcaucasian 2.581, Bessarabian 1.958, and Cuban 1.897 per cent of nicotin. The highest nicotin content found in Crimean tobaccos was 3.738 per cent, in Transcaucasian 3.942, in Cuban 3.562, and in Bessarabian 2.635. The dried tobaccos were lower in nicotin than the fermented material, and the lower leaves on the plants proved to be richer in nicotin than the upper ones. Notes on the culture of tobacco in Crimea, Bessarabia, and the Caucasus are also presented.

Distribution of seeds and plants by the Department of Agriculture, B. T. Galloway (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 100, pp. 23, figs. 12*).—This circular reviews the history of the purchase and distribution of seeds and plants by the Government, cites from different acts the passages providing for this work under the Department of Agriculture, describes in detail the congressional seed distribution, and summarizes the Department's work in introducing rare seeds and plants. Some of the more important results of plant introduction are briefly noted.

Report of the seed control station at Lund, 1911, A. Vilke (*Malmö. Läns Hushåll. Sällsk. Kvrtlsskr., 1912, No. 1, pp. 202–227*).—The examination of 3,222 samples of seed is reported and the principal features brought out by the results are discussed.

A warning against fan weed, D. B. Swingle and A. Atkinson (*Montana Sta. Circ. 12, pp. 43–53, figs. 3*).—This circular gives a description of fan weed (*Thlaspi arvense*), points out its injurious character, together with the manner of its introduction into new territory, and suggests methods for its control.

HORTICULTURE.

Fertilizer experiments with muskmelons, J. W. Lloyd (*Illinois Sta. Bul. 155, pp. 25–64, figs. 6*).—The experiments reported were conducted during the seasons 1905 to 1909, inclusive. The chief objects of the work have been to determine the relative efficiency of different amounts of manure and methods of applying manure; the effect of supplementing manure with commercial forms of phosphorus; the effect of using a complete commercial fertilizer in connection with manure; and the effect of substituting commercial fertilizer for manure under conditions typical of 2 of the leading melon-producing regions of Illinois. Twenty different fertilizer treatments were employed.

The results of the experiments as a whole indicate that there may be wide differences in the relative effects of different fertilizers for Gem melons in different seasons. Under the conditions of these experiments, however, manur-

ing in the hill proved far superior to broadcast manuring, except where a very large amount of manure can be broadcasted. A large amount of manure used in the hills is conducive to the production of a large yield of early melons. Owing to the expense of the manure, however, from 2¼ to 3 tons of manure per acre carefully applied to the hills may produce a greater net profit than 4½ to 12 tons per acre applied to the hills or from 16 to 20 tons applied broadcast. Mixing the manure with the soil of the hill has no apparent advantage over applying the same amount of manure without mixing, except possibly where a large amount of manure is applied to the transplanted crop. The addition of raw rock phosphate to a moderate amount of manure in the hills may increase the yield of early melons, the total yield, and the net profits in the field planted crop. Although the use of a complete fertilizer, consisting of steamed bone, dried blood, and potassium sulphate, applied broadcast in addition to manuring in the hill, is conducive to the production of large total yields, the cost of such a fertilizer may render its use inadvisable. The application of the above chemical fertilizer to the hills in place of manure is attended with great danger, especially to the field planted crop, where the yield may be greatly reduced as compared with no fertilizer treatment.

Cover crops for orchards in the Rogue River Valley, P. J. O'Gara (*Off. Path. Rogue River Valley [Oreg.] Bul. 8, 1912, pp. 6, fig. 1*).—According to the author's experience during the past 3 years, a combination of common vetch and winter oats has given the best results as an orchard cover crop in the Rogue River Valley.

The rejuvenation of orchards.—Report of spraying, fertilization, and thinning experiments in southeastern Ohio, 1911, F. H. Ballou (*Ohio Sta. Bul. 240, pp. 479–512, figs. 10*).—In continuation of previous demonstration experiments conducted by the station in Washington County (E. S. R., 25, p. 337), the results of spraying, fertilizer, and thinning experiments conducted in 1911 are reported.

The author found that apple trees sprayed with and injured by Bordeaux in 1910 still lacked vigor and failed to produce well, although sprayed with lime-sulphur in 1911. Trees sprayed with lime-sulphur in both years were in splendid vigor in 1911, the foliage and blossoms opened earlier, more uniformly, and in much greater luxuriance and profusion, and a good crop was produced. Trees sprayed with Bordeaux in both years generally produced a lighter crop and fruit of inferior quality as compared with the lime-sulphur sprayed trees. Sooty fungus was thoroughly controlled with the lime-sulphur spray applied late in July, it proving equally as effective as Bordeaux. The application in 1910 of chemical fertilizers with a high nitrogen content assisted the trees materially in overcoming Bordeaux injury. Remarkably increased yields were secured by using nitrogenous chemical fertilizers on the poor soils included in these experiments. Mulching and fertilization with chemicals constituted an admirable method of culture and feeding for orchards situated on steep ground. Thinning apples where the trees were overburdened proved to be a profitable practice.

Relative to the financial importance of spraying, the author points out that previous to 1909, the year in which the demonstration experiments were started, Washington County was buying apples for home use. In 1910 the income from the orchards of the county amounted to $65,000, and in 1911 to $200,000.

A spraying program for Montana orchards, R. A. Cooley and D. B. Swingle (*Montana Sta. Circ. 17, pp. 119–153, figs. 12*).—Descriptions are given of some of the more important fungus diseases and insect pests of orchards, together with a spraying calendar for Montana orchards.

Some common spray mixtures, O. S. WATKINS (*Illinois Sta. Circ. 160, pp. 19, figs. 2*).—This circular describes the more important fungicides and insecticides used for spraying apples and gives a spraying schedule for Illinois apple orchards.

Tests of lime-sulphur, Bordeaux mixture, and other sprays, O. S. WATKINS (*Illinois Sta. Circ. 159, pp. 34, figs. 8*).—The tests here reported were conducted by the station in an apple orchard at Neoga, Ill., during the summers of 1910 and 1911 to determine the relative efficiency of lime-sulphur mixtures and Bordeaux mixture, the comparative value of different commercial brands of arsenate of lead, and the value of certain new fungicides and insecticides. The results are tabulated and fully discussed.

A 4:4:50 Bordeaux mixture was more efficient as a fungicide than any of the lime-sulphur sprays. Self-boiled lime-sulphur was easily washed off and possessed very little fungicidal value in the control of apple scab. Applications of lime-sulphur combined with arsenate of lead made later than 2 or 3 weeks after the fall of the petals were apt to cause serious injury to both foliage and fruit.

Injuries following the use of Bordeaux mixture were lessened by following the Bordeaux as soon as dry with an application of 4:50 milk of lime and by using the drench spray of Bordeaux mixture. Milk of lime appeared to stimulate the foliage and in 1910 shielded the fruit from an April freeze.

The mixture of lime-sulphur and arsenate of lead was more efficient in preventing apple scab than lime-sulphur used alone. Combinations with neutral or ortho arsenate of lead gave better results than arsenates containing higher percentages of arsenic oxid. Arsenate of lead when used alone exerted some fungicidal action but caused considerable foliage injury. Lime-sulphur arsenate in combination with copper sulphate gave an efficient spray and caused no injury to either fruit or foliage.

Sulfocide in combination with Paris green caused very serious foliage injury. Cucasa proved almost as efficient as Bordeaux in preventing scab infection and caused no russeting of the fruit, but did considerable injury to the foliage. Copper ferrocyanid made from copper sulphate and potassium ferrocyanid controlled scab and insects very efficiently.

The most satisfactory treatment for apples consisted of 4:4:2:50 Bordeaux arsenate applied immediately preceding bloom; 4:50 lime-sulphur solution plus 2 lbs. of arsenate of lead applied immediately after the fall of the petals; and 4:4:2:50 Bordeaux arsenate applied about 10 days after the fall of the petals.

Sulphur-arsenical spray injury and its prevention, J. P. STEWART (*Advance Rpt. from Conn. Pomol. Soc., 21 (1912), pp. 13–24, fig. 1*).—A paper on this subject presented at the twenty-first annual meeting of the Connecticut Pomological Society and based on results of tests conducted at the Pennsylvania Station.

Water core of apple, P. J. O'GARA (*Off. Path. Rogue River Valley [Oreg.] Bul. 9, 1912, pp. 8, fig. 1*).—A popular bulletin in which the author discusses the causes of water core and offers suggestions relative to the proper handling of crops where some water core is known to exist.

The possibility and frequency of self-fertilization in cultivated grapes, GARD (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 295–297*).—Experiments conducted with a number of varieties of cultivated grapes lead the author to conclude that self-fertilization is not only possible but frequent.

The pineapple in Hawaii, J. E. HIGGINS (*Hawaii Sta. Press Bul. 36, pp. 34, figs. 15*).—This comprises a popular summary of the results of experience on the more important aspects of pineapple cultivation in Hawaii. It discusses

soils, location of plantation, propagation, preparation of the soil, planting, tillage, removal of crowns, gathering the crop, rattooning, fertilizers, marketing, crates and packing, shipping, varieties, and diseases and other injuries and their remedies.

A brief discussion of insect pests, by D. T. Fullaway, is also included.

Planting trees and shrubs on the dry farm, O. B. WHIPPLE (*Montana Sta. Circ. 14, pp. 79–94, figs. 2*).—A popular circular discussing the selection of plants, selection and preparation of soil, and planting and care of trees and shrubs for the dry-farming region of Montana. Consideration is given to planting for ornamental purposes, for protection, and for a supply of fruit.

The composition and fertilizer requirements of flowering bulbs, M. L. FONDARD (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 91–97*).—Data are given showing the composition of fresh and dried flowering bulbs of various kinds, together with a table showing the amounts of the principal fertilizer ingredients removed from the soil by each kind of bulb.

FORESTRY.

Euphorbia lorifolia, a possible source of rubber and chicle, W. MCGEORGE and W. A. ANDERSON (*Hawaii Sta. Press Bul. 37, pp. 16*).—This bulletin reports a study of the physical and chemical properties of the latex of the koko tree (*Euphorbia lorifolia*), which contains an unusually large quantity of easily obtained latex and occurs in large numbers in the Hawaiian Islands. Some experiments in tapping the wild koko tree are also noted.

A comparative analysis was made of Ceara, balata, and Euphorbia latexes. The Euphorbia yielded 15.8 per cent of caoutchouc as compared with 13.95 per cent for balata, and 75.72 per cent for Ceara. The Euphorbia caoutchouc appears to be of an inferior quality, although it might find use as a low-grade product. The constituents which appear to be of most commercial value are the alcohol and acetone soluble resins, the acetone soluble resin being a product of very fine texture and physical appearance. Euphorbia latex gave a total resin content of 55.95 per cent as compared with a resin content of 47.71 per cent for balata. Since the physical properties of the resins from both trees are similar, it is pointed out that the Euphorbia resin should serve as an excellent substitute for the balata resin in the manufacture of chewing gum.

In observations made on trees growing in the forest, it was concluded that they will grow on very thin soil, at high elevations, with small rainfall, and will live and yield large quantities of latex through long and severe droughts. The trees reproduce freely, and the seedlings are very hardy. The trees can be tapped much like the Castilla tree and about as often. Further observations are to be made relative to the economic importance of the wild tree and also relative to the rate of growth of trees under cultivation and their suitability as plantation trees.

Growth studies in forest trees.—I, Pinus rigida, H. P. BROWN (*Bot. Gaz., 54* (*1912*), *No. 5, pp. 386–403, pls. 2*).—This is the first of a series of studies undertaken to clear up disputed points regarding the annual ring formation of trees and to formulate laws of tree growth. The methods of study are described and considerations are given to the microscopical characters of the wood and of the cambium and cortex in winter condition, cambial awakening, place of cambial awakening, growth in lateral branches, rate of procedure, width of the ring, and secondary thickening in the roots.

Fire-killed Douglas fir: A study of its rate of deterioration, usability, and strength, J. B. KNAPP (*U. S. Dept. Agr., Forest Serv. Bul. 112, pp. 18, pls. 2,*

figs. 3).—The study here reported is based both on field observations and on compression, bending, and other tests conducted in cooperation with the University of Washington, at Seattle.

In general the tests indicate that the sound wood from fire-killed Douglas fir of the Pacific Northwest may safely be used for general construction purposes and that its merits are nearly, if not quite, equal to those of material from green, growing trees. After a considerable number of years the fire-killed fir is only slightly weaker than the green timber.

The utilization of wood, J. Bersch, revised by W. Bersch (*Die Verwertung des Holzes. Vienna and Leipsic, 1912, 3. rev. ed., pp. VII+331, figs. 76*).—A descriptive account is given of the utilization of wood in the production of acetone, acetic acid, pyroligneous acid, tar oils, etc., oxalic acid, cellulose, tannin and dye extracts, ethereal oils, and resins.

Tests of structural timbers, M. Cline and A. L. Heim (*U. S. Dept. Agr., Forest Serv. Bul. 108, pp. 123, pls. 7, figs. 29*).—This bulletin correlates all the tests which have been made by the Forest Service on structural timbers, exclusive of round timbers and other special forms (E. S. R., 19, p. 651). The results of many of these tests have been previously noted separately (E. S. R., 27, p. 846). The text of the bulletin serves as a guide to the study of numerous diagrams and tables, and the appendix contains complete descriptions and test data of the timbers tested. The bulletin also discusses the establishment of standard specifications and grading rules for structural timbers, based on their mechanical properties. A comparison is made of tentative grading rules with export grading rules of the Pacific Coast Lumber Manufacturers' Association and with the standard specifications of the American Railway Engineering and Maintenance of Way Association.

The specific heat of wood, F. Dunlap (*U. S. Dept. Agr., Forest Serv. Bul. 110, pp. 28, pl. 1, figs. 5*).—Determinations were made of the mean specific heats of 20 species of wood accurately measured over the interval between 106° C. and 0°. The apparatus and methods employed are described and the results are presented in tabular form and fully discussed.

Preliminary results were secured which indicate a great variation of specific heat with temperature. Likewise there appears to be an increase of specific heat due to steaming. The variations in specific heat within a species due to the locality in which it was grown or to the use of heartwood as compared with sapwood were too small to be taken into consideration.

A description of the procedure in generalizing results and the results calculated for each cylinder of wood tested are appended.

Lightning in relation to forest fires, F. G. Plummer (*U. S. Dept. Agr., Forest Serv. Bul. 111, pp. 39, pls. 2, figs. 16*).—In this bulletin the author has aimed to bring together all existing data relating to lightning and trees, including also the results of observations made upon the National Forests and of laboratory experiments by the Forest Service, for the purpose of forming some definite conclusions regarding the relative frequency with which trees are struck, the conditions which tend to produce the greatest danger, and the relative susceptibility of different forms and species.

A summary of all the data deemed worth considering leads the author to conclude that trees are the objects most often struck by lightning because of their great number, their greater height, and of their ideal form for conducting an electrical discharge to the earth. The greatest number struck in any locality will be of the dominant species. The likelihood of a tree being struck by lightning is increased if it is taller than surrounding trees, if it is isolated, if it is upon high ground, if it is deeply rooted, and if its conductivity has been in-

creased by becoming thoroughly wet with rain. Most forest fires caused by lightning probably start in the humus at the base of the tree.

Report of the forestry department for the year ended June 30, 1911, R. D. HAY (*Rpt. Forestry Dept. N. S. Wales, 1911, pp. 33, pls. 35, figs. 16*).—In addition to a summarized statement of the operations of the department of forestry for the year ended June 30, 1911, an article on reafforestation and the hardwood supply, by E. H. F. Swain, and a summarized report on the strength, elasticity, and other properties of New South Wales hardwood timbers, by W. H. Warren (E. S. R., 27, p. 43), are appended.

DISEASES OF PLANTS.

[Some new Russian fungi], O. TREBOUX (*Hedwigia, 52 (1912), No. 5, pp. 316–318*).—The author gives a list of about 50 fungi from Russia with hosts upon which, it is claimed, they have not been reported heretofore. Of these fungi, 7 are said to be new, as follows: *Ustilago trebouxi*, on *Melica ciliata* and *Triticum cristatum; Puccinia festucina*, on *Festuca ovina; P. permixta*, on *Diplachne serotina; P. proximella*, on *Pyrethrum millefoliatum; Puccinia trebouxi*, on *Melica ciliata; Uromyces ceratocarpi*, on *Ceratocarpus arenarius;* and *Uromyces kochiæ*, on *Kochia prostrata.*

Cultures of heterœcious rusts, W. P. FRASER (*Mycologia, 4 (1912), No. 4, pp. 175–193*).—The author describes the results of culture experiments carried on during the spring and early summer of 1911 with a number of heterœcious rusts. With 12 species he has supplemented previous investigations regarding the host plants, while the life histories of 6 are reported for the first time.

Physiologically distinct forms of Glœosporium fructigenum, O. SCHNEIDER-ORELLI (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 322–326*).—Continuing briefly a discussion previously noted (E. S. R., 26, p. 849), the author here states in substance that the American form of *G. fructigenum* did not develop on pear gelatin at 5° C., while the European form made a fair growth in 35 days; that at 15° the former showed the larger growth in 12 days; that the former apparently reached its maximum a little above 23°, the latter somewhat below that point, while from these maximal points development declined steeply for rising temperatures, ceasing near 32° for the latter; that inoculation experiments on live fruits also showed a higher activity for the American form, especially in the younger fruit, favoring earlier attack and agreeing with the large losses observed in the United States from bitter rot; and that twigs were attacked by the American but not by the European fungus. The suggestion is made that these biologically distinct forms be distinguished as North American and as European *G. fructigenum*, respectively.

The smuts of wheat, oats, barley, and corn, E. C. JOHNSON (*U. S. Dept. Agr., Farmers' Bul. 507, pp. 32, figs. 11*).—Popular directions are given for the recognition of the different smuts of cereals, the characteristics and life habits of the fungi are briefly described, and directions are presented for the treatment of seed for the prevention of stinking smut of wheat, smut of oats, covered smut of barley, and loose smut of wheat and barley, with suggestions for the prevention of the spread of the smut of corn.

The smuts of cereals, G. M. REED (*Ann. Rpt. Missouri Bd. Agr., 44 (1911), pp. 253–265, figs. 5; Missouri Bd. Agr. Mo. Bul., 10 (1912), No. 7, pp. 3–15, figs. 5*).—The author gives descriptions of stinking smut or bunt of wheat, loose smut of oats, and corn smut, together with suggestions for their control by selection and treatment of seed.

Foot disease of wheat and rye, K. STÖRMER and R. KLEINE (*Illus. Landw. Ztg., 32 (1912), No. 62, pp. 564–566*).—This is a brief discussion of the foot dis-

cases of wheat and rye ascribed to *Ophiobolus herpotrichus* and to species of Leptosphæria and some undetermined fungi, respectively. The severe frosts of the previous winter are claimed to favor the appearance and progress of these diseases by weakening the plants.

Careful selection of seed and use of lime, potash, and phosphorus in fertilizers are claimed to lessen injury from these fungi.

Foot disease appearing on surviving wheat weakened by cold, K. Störmer and R. Kleine (*Illus. Landw. Ztg., 32 (1912), No. 38, pp. 360–361*).—*Ophiobolus herpotrichus* and *Typhula graminum* were found to be the cause of the continued dying-out observed in a field of wheat which had been greatly thinned by the severe cold of January and February in north Germany. The former fungus, it is said, had before been known to cause stalk disease in that region. It is claimed that the latter, heretofore known only in Sweden and Denmark, has now been shown to be native to the Pomeranian coast. The fungi are thought to winter on the green plants, and possibly on stubble.

Preventive measures suggested are the breeding of varieties of wheat more resistant to cold and avoidance of a succession of crops favorable to the growth of these fungi.

Parasites of alfalfa, G. Gandara (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 29 (1910), No. 7–12, pp. 369–394, figs. 18*).—A brief account is given of plant parasites injurious to *Medicago sativa*, including *Cuscuta* sp., *Orobanche rubens*, *Uromyces striatus*, *Peronospora trifoliorum*, *Erysiphe polygoni*, *Pseudopeziza trifolii medicaginis*, *Cercospora kelcola medicaginis*, *Colletotrichum trifolii*, *Sclerotinia trifoliorum*, *Rhizoctonia violacea*, *Urophlyctis alfalfæ*, *Asterocystis radicis*, and a *Pleospora* thought to be a new species. A brief discussion of each parasite and of remedial measures for its control is given.

Potato leaf roll and our potato crops, O. Appel and O. Schlumberger (*Arb. Deut. Landw. Gesell., 1911, No. 190, pp. 102+8, pls. 9, figs. 15*).—The authors give a discussion of the present state of knowledge of potato leaf roll as to its symptoms, cause, spread, the resistance of potato varieties, and preventive measures; an account, statistical and graphical, of the potato crops of 1908 to 1910; and their conclusions regarding the possibility of an increase of yield, which is stated to have been lower than should be expected for some years past. A general improvement of the conditions of fertility and cultivation, according to more specific suggestions given, is held to be the best means of combating the injury referable to leaf roll disease. An extensive bibliography is appended.

Disease resistance in varieties of potatoes, C. R. Orton (*Proc. Ind. Acad. Sci., 1910, pp. 219–221*).—This report is the result of experiments conducted by the author with 76 varieties of potatoes, of which 46 were obtained in Europe, testing their resistance to *Phytophthora infestans*.

On a somewhat arbitrary percentage basis, the findings in duplicate series agreeing closely, however, the varieties tested were arranged in (1) a highly resistant class in which the fungus showed a growth of from 1 to 35 per cent; (2) a middle class exhibiting a growth of from 35 to 65 per cent; and (3) a susceptible class showing a growth of from 65 to 100 per cent. Class 1 consisted wholly of tested disease-resistant potatoes, practically all of European origin. Class 2 was made up largely of tubers of reputed disease resistance which were also largely of European origin. Those of class 3 were practically all of American origin and included many of the most important commercial varieties.

It is concluded that American breeders have developed yield, while European breeders have developed disease-resistant varieties. It is suggested, also, that this may account for the heavy loss by fungus diseases of American potato

crops. The further suggestion is made that by breeding both these desirable features might be developed together. The laboratory method here employed is recommended for testing disease resistant qualities of potatoes.

Potato diseases in Wisconsin and their control, L. R. JONES (*Wisconsin Sta. Circ. Inform. 36, pp. 10*).—Popular descriptions are given of various potato diseases which are known to occur in Wisconsin, together with directions for their control.

Iliau, an endemic cane disease, H. L. LYON (*Hawaiian Sugar Planters' Sta., Path. and Physiol. Bul. 11, pp. 32, pl. 1, figs. 10*).—This is a disease of sugar cane peculiar to the Hawaiian Islands and has been present for many years. The first account of the disease seems to have been that published by Cobb (E. S. R., 18, p. 843).

The disease is characterized by the binding of the leaf bases into a tight, unyielding jacket about the stem. A study of the material has shown that it is due to a fungus, the predominant factor being the imperfect fungus Melanconium. Subsequent studies have shown that a perfect form of the fungus is sometimes present, and the name *Gnomonia iliau* n. sp. is given it. The imperfect or Melanconium stage of the fungus is said to be of constant occurrence on the diseased shoots, and the spores are thought to be largely responsible for the local spread of the disease.

This trouble seems to be particularly an infection of young canes and flourishes only during cool, damp weather. All of the old, standard varieties seem equally susceptible to attacks of the fungus, but the Demerara seedlings are found resistant to a considerable degree.

A technical description of the fungus is given.

Further notes on timothy rust, F. D. KERN (*Proc. Ind. Acad. Sci., 1909, pp. 417, 418*).—The author reports that this rust has spread, as was predicted in a previous paper (E. S. R., 20, p. 1043), and is now found in localities farther west. Its range extended at the time of this report from Maine to Minnesota and south to West Virginia and Indiana, 9 States in all being invaded by the fungus, which the author now considers to be a variety or subspecies of *Puccinia poculiformis* or *P. graminis*.

Further notes on timothy rust, A. G. JOHNSON (*Proc. Ind. Acad. Sci., 1910, pp. 203, 204*).—The author gives an account of studies made by him on *Puccinia poculiformis*, which seems to be spreading, having been reported from a number of new localities.

In most specimens seen, uredospores were much more abundant than teleutospores. The vitality of some uredospores tested was found to be greater in those from green blades, but that of spores from blades killed by frost was also high. This is thought to point to the probability that the fungus may be able to pass the winter here in uredo stage, as it is believed to do in Europe. Conditions favoring its development are said to be a heavy, luxuriant growth of the host on ground that tends to hold moisture, also rainy weather with cool nights and moderately warm and still days.

While both air and soil drainage are mentioned as possible means of lessening attack, still more hope is expressed in the development of a strain of timothy having a high resistance to rust.

Studies on the development and spread of decay fungi in storage fruit, O. SCHNEIDER-ORELLI (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, p. 322*).—This is a brief continuation of previous reports on rots of storage fruits (E. S. R., 26, p. 749). The differences observed in the activity of the various fungi are claimed to be referable to the influences of weather and season, stages of ripeness in the fruit, numbers of spores in the air or on fruit surfaces, and the agency of insects as carriers of infection.

Phytophthora omnivora causing die-back of apple trees, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 321, 322*).—A disease of apples was found to be due to attack by *P. omnivora*, supposed to have been favored by the wet season and the consequent splashing of the trees with infectious material from heavily infected weeds and strawberries in the vicinity.

The olive knot, W. T. HORNE (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 9, pp. 592–600, figs. 5*).—This is an account of experiments made with olive knot in California, as the result of which it is stated that continual wetting of the knots by rain favors the exudation of an opalescent slime which contains in large numbers the organism (*Bacterium savastanoi*) which is said to cause the knots. Dispersion of this organism is thought to occur by washing, spattering, and other means. Infection is thought to take place for the most part through natural fissures on the uninjured bark, where the bacteria are kept moist while penetrating the tissues into the living bark.

Remedial measures have not yet been worked out in an entirely satisfactory way, but cutting off knots and disinfecting the wounds during the summer, spraying or painting with fungicides during the autumn, and cutting away infected smaller branches are said to be beneficial measures.

Court noué on vines near Montpellier, P. JACCARD and J. BURNAT (*Rev. Vit., 37 (1912), No. 961, pp. 665–668; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1672, 1673*).—Continuing previous studies by Jaccard (E. S. R., 24, p. 350), the authors state that in a vineyard on good soil near Montpellier the vines were affected with court noué which, slowly spread, and that when these vines were taken up and a new variety planted the young vines also showed the disease. No parasite or traumatic or frost injury could be connected with the disease, but the diseased shoots were less lignified, while the leaves showed an alteration of chlorophyll (the veins reddening first) and appeared to form prematurely an abscisslayer, so as to be easily pulled off. Grafting is thought to have played a negligible part, if any at all, in causing this disease.

The conclusion reached is that the disease is probably one of physiological origin, related in some way to nutrition. The suggestions are made that high productivity may be a factor, causing exhaustion of both soil and vine, and that manuring in holes, by encouraging the roots to grow continually in the same soil, may cause exhaustion or fatigue of those portions. It is suggested that an even distribution of the manures employed and severe pruning to restrain productivity may lessen the injury due to court noué.

Infection of grapevines by Plasmopara (Peronospora) viticola, H. MÜLLER-THURGAU (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 318, 319*).—This is a brief account of a continuation of previous investigations (E. S. R., 26, p. 851).

The results, it is said, were confirmatory of conclusions previously announced. No infections occurred on the unwounded upper surface of the leaf, while the great majority of the inoculations developed infection on the lower. Fully grown leaves developed infection somewhat sparingly, and on these the fungus growth remained small, developing few conidiophores and soon dying out. On young and still tender leaves the infection was more common and the formation of conidia was abundant. On still younger leaves, less infection occurred, and on several of the youngest leaves none could be found, even on the lower surfaces. A notable feature was that a large number of oöspores developed within two weeks of the infection. The noninfection of the upper leaf surface is accounted for by the almost total absence of stomata on that side, and these facts are held to be of high significance in relation to a new plan for a more economical and effective protection by application of sprays to the lower leaf surface only.

Wintering over of Plasmopara (Peronospora) viticola, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 319, 320*).—The author reports that a search of mildewed leaves on grapevines in October, 1909, showed the presence in large numbers of oöspores of Peronospora on each of several varieties of cultivated grapes, especially on the variety Aramon Tupestris. It is claimed that this indicates where and in what form this fungus passes the winter, and that a starting point has been obtained for a plan of attack on this disease in early spring.

Further studies on red scald of grapes, H. MÜLLER-THURGAU (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 313–318*).—In continuance of work reported on from 1902 to 1903 (E. S. R., 14, p. 1089; 15, p. 486), the author gives a brief account of his investigations made on *Pseudopeziza tracheiphila*, said to cause red burn or red scald of grapevines.

It is claimed to have been shown that the fungus spreads from the fallen leaves, forming conidia in late summer and autumn, and that in the following spring ascospores are liberated from the apothecia which form in late fall and winter. Inoculation experiments resulted in infection and production of typical symptoms of the disease in fewer than half the experiments, the causes of failure not having been determined. Infection occurred on the upper as well as the lower side of the leaves. The attacks of this fungus are thought to be favored by drought or by restriction of the root system of the vines.

It is said that proper spraying with Bordeaux mixture gives sufficient protection, but that circumstances render it difficult to ascertain the most suitable time for this application.

Phytophthora on strawberries, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 320, 321*).—The author reports the occurrence on strawberries of *Phytophthora omnivora*, describing the effects of its presence on the fruit. It is said that in rainy weather the fungus develops in or on the fruit oöspores, swarmspores, and conidiospores, increasing the difficulty of its control.

The large leaf spot of chestnut and oak, A. H. GRAVES (*Mycologia, 4 (1912), No. 4, pp. 170–174, pl. 1, fig. 1; abs. in Phytopathology, 2 (1912), No. 2, p. 92*).—The author reports finding a leaf spot disease occurring abundantly on the leaves of the chestnut and oak in Virginia, North Carolina, and Georgia, which he has called the large leaf spot to distinguish it from a smaller leaf spot common to the chestnut leaf and due to the fungus *Septoria ochroleuca*.

On leaves of the chestnut the large leaf spot makes its appearance about August 1 as small circular spots, which increase by concentric bands until they attain a diameter of 5 or 6 cm. By the coalescence of several spots often half or more of the leaf may be killed. The under side of the leaf exhibits a whitish moldy character on the margin of the diseased area, due to the projecting growth of the mycelium. The disease on the leaves of the red oak (*Quercus rubra*) exhibits similar symptoms.

The fungus causing the disease has been identified as *Monochætia desmazierii*. Successful infection experiments have been carried on with it, and from the results obtained it appears that insect bites or mechanical injuries aid the fungus materially in gaining entrance to the leaf, although it is not definitely known that it can not enter the leaf without this assistance.

In some cases trees were found which had lost at least 40 per cent of their green assimilating tissue as a result of attacks of the fungus. Usually the damage is much less, but it is believed to be sufficient to cause considerable diminution in the annual wood increment.

So far as the disease occurs in the forest, very little at present can be done to check it. Upon individual trees it is thought probable that spraying would prevent the recurrence of the fungus.

Steccherinum septentrionale in Indiana, H. J. BANKER (*Proc. Ind. Acad. Sci., 1910, pp. 213–218, fig. 1*).—The author gives some observations made on this fungus, also known as *Hydnum septentrionale*, and somewhat rarely met in Indiana. It seems to prefer beech, but is also thought to be found growing on maple and perhaps hickory in some sections, possibly also on linden and elm in Europe. The mycelium ramifies in the heartwood of large live trees, appearing at openings to form its immense sporophores. The fungus seems rather saprophytic than parasitic in habit and has not been shown to kill or seriously injure its host.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

National reservations for the protection of wild life, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 87, pp. 32, figs. 5*).—This circular brings together for convenient reference the more important facts regarding the various reservations, of which there are 95 scattered in 26 States and Territories and the District of Columbia. A list of some of the more important publications with special reference to the fauna or to the administration of the preserves is included.

Directory of officials and organizations concerned with the protection of birds and game, 1912, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 88, pp. 16*).—This thirteenth annual directory of officials and organizations concerned with the protection of birds and game in the United States and Canada follows the arrangement of previous years (E. S. R., 25, p. 757).

Regulations for the protection of game in Alaska, 1912 (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 89, pp. 2*).—The regulations here promulgated relate to the open season for deer, limit in number killed, the sale of deer carcasses, the killing of deer on certain islands, the killing of caribou on the Kenai Peninsula, and the season for killing walrus.

Food of our more important flycatchers, F. E. L. BEAL (*U. S. Dept. Agr., Bur. Biol. Survey Bul. 44, pp. 67, pls. 5*).—This account is based upon examinations of 3,398 stomachs, belonging to 17 species, most of which were obtained in the United States and the remainder in British America.

The animal food in the whole number of stomachs averaged 94.99 per cent and the vegetable 5.01 per cent. "Hymenoptera (wasps, bees, and ants) amount to nearly 35 per cent of the average diet of the 17 species. . . . Of 13 of these species Hymenoptera are the largest element in the diet. Of 1 species Orthoptera (grasshoppers and crickets) are the leading food; in another Lepidoptera (moths and caterpillars) are the favorites; and in 2 others Diptera (flies) stand at the head. Hemiptera (bugs) are eaten quite extensively by some, but naturally the ones taken are the larger flying species. Plant lice and scales have not yet been found in the stomach of any flycatcher, though one bird was shot on a plant covered with lice, with which its bill was filled.

"The flycatchers for the most part inhabit the open country and prefer to live about gardens, orchards, and sparsely timbered hillsides. Several species are not averse to human neighbors and make their nests in the crannies of buildings, while a number of others build in covered sites, such as hollow trees, under bridges, or under the overhanging bank of a stream."

The species considered are the scissor-tailed flycatcher (*Muscivora forficata*), kingbird (*Tyrannus tyrannus*), Arkansas kingbird (*T. verticalis*), Cassin's

kingbird (*T. vociferans*), crested flycatcher (*Myiarchus crinitus*), ash-throated flycatcher (*M. cinerascens*), phœbe (*Sayornis phœbe*), Say's phœbe (*S. sayus*), black phœbe (*S. nigricans*), olive-sided flycatcher (*Nuttallornis borealis*), wood pewee (*Myiochanus virens*), western wood pewee (*M. richardsoni*), yellow-bellied flycatcher (*Empidonax flaviventris*), western yellow-bellied flycatcher (*E. difficilis*), Acadian flycatcher (*E. virescens*), Traill's and alder flycatchers (*E. trailli trailli* and *E. trailli alnorum*), and least flycatcher (*E. minimus*).

While some of the insects taken by flycatchers for food are parasitic and predaceous Hymenoptera, which are to be classed among useful insects, "impartial consideration of the diet of these flycatchers throughout the year, however, leads to the conclusion that on the whole the birds do considerably more good than harm and hence should be protected as allies of the farmer and the horticulturist."

Insects injurious to stored grains and their ground products, A. A. GIRAULT (*Illinois Sta. Bul. 156, pp. 67–92, figs. 14*).—This is a popular account in which 9 of the more important granary moths, beetles, and weevils are considered. Preventive and remedial measures are discussed and a key given for the identification of granary insects.

Some shade tree pests in eastern Massachusetts, A. F. BURGESS (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 172–180, pls. 2*).—A general discussion of shade tree conditions in eastern Massachusetts. The pests referred to are the European bark beetle (*Eccoptogaster multistriata*), leopard moth, white-marked tussock moth, elm-leaf beetle, and gipsy and brown-tail moths.

Notes on three shade tree pests, G. W. HERRICK (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 169–172*).—These notes relate to the elm-leaf beetle (*Galerucella luteola*), elm sawfly leaf-miner (*Kaliosysphinga ulmi*), and larch case bearer, and their control.

Damage to the wood of fire-killed Douglas fir, and methods of preventing losses, in western Washington and Oregon, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Circ. 159, pp. 4*).—This circular is to supplement Forest Service Bulletin 112 (see p. 49) and Bureau of Entomology Circular 127, previously noted (E. S. R., 24, p. 256). Whenever the dying and dead timber is available for utilization within 1 to 6 or more years, much, and sometimes practically all of the loss due to wood-boring insects is said to be preventable.

Unconsidered factors in disease transmission by blood-sucking insects, F. KNAB (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 196–200*).—The author points out that, in order to be a potential transmitter of human blood parasites, an insect must be closely associated with man and normally have opportunity to suck his blood repeatedly.

Results of experiments to determine the effect of Roentgen rays upon insects, W. D. HUNTER (*Jour. Econ. Ent., 5 (1912). No. 2, pp. 188–193*).—After first reviewing the literature relating to this subject, the author briefly reports experiments carried on with the rice weevil, 3 species of ticks (*Margaropus annulatus, Argas miniatus,* and *Dermacentor venustus*), 2 isopods (*Armadillidium vulgare* and *Porcellio lævis*), *Culex pipiens*, the sugar-cane mealy bug, and the sugar-cane borer. The work fails to indicate that the rays had any effect whatever upon the fertility or development of the various stages of these species.

Papers on deciduous fruit insects and insecticides.—The one-spray method in the control of the codling moth and the plum curculio, A. L. QUAINTANCE and E. W. SCOTT (*U. S. Dept. Agr., Bur. Ent. Bul. 115, pt. 2, pp. 87–112, pl. 1, figs. 4*).—This is a second report on the one-spray method in the control of the

codling moth in comparison with the usual demonstration treatment of from 3 to 5 applications, according to locality. The experiments here reported are in continuation of those detailed in the publication previously noted (E. S. R., 24, p. 260), and were carried on in connection with other experimental work at several field stations, namely, in Virginia, Michigan, Delaware, and Kansas, in cooperation with the Bureau of Plant Industry, attention having also been given to the control of certain apple diseases.

The results corroborate those previously reported as to the efficiency of the one-spray method in controlling the codling moth and plum curculio. "Bringing together the results of all of the tests which represent several seasons and varied conditions, it is found that the average of the percentages of sound fruit from a single spraying is 90.64 as compared with 96.19, the average of the percentages of sound fruit on the demonstration plats receiving from 3 to 5 applications. The unsprayed plats show an average of 57.79 per cent of fruit free from codling-moth injury. The variation in percentage of sound fruit is considerably greater with plats receiving the single application than where the demonstration treatment was given, indicating, perhaps, a less degree of insurance from injury, especially under unusual seasonal conditions, as in case of injury of fruit by hail, etc., as occurred in Virginia during 1909. For the entire period the range in percentage of sound fruit on the demonstration plat is from 92.91 (Michigan, 1911) to 99.42 (Virginia, 1910), and on the one-spray the range is from 84.07 per cent (Virginia, 1909) to 99.01 per cent (Virginia, 1910)."

These data, "while obtained under rather variable conditions of experiment, establish beyond doubt that a single thorough application of an arsenate of lead spray at once after the falling of the petals will protect from codling-moth injury a large percentage of the crop, though not quite so high a percentage as by several applications designed to protect the fruit during the entire season.

"While the information as regards the plum curculio is not so full as desirable, it also appears that this insect is controlled by the single thorough treatment practically as well as by the usual 3 or 4 applications. Thus the 6 orchards where data were obtained by the Bureau on the curculio give an average percentage (average of percentages) of fruit free from injury on the one-spray plat of 82.62 as compared with 82.40 per cent of sound fruit on plats receiving the demonstration treatment. The percentage of sound fruit on the unsprayed trees was 55.50. Results obtained by Rumsey [E. S. R., 23, p. 259] fully substantiate the foregoing. . . . In the case of the curculio the degree of protection afforded by spraying varies much more widely than for the codling moth, depending upon the abundance of the insects and the quantity of fruit present on the trees. . . .

"It would therefore appear from the foregoing that for the control of the codling moth and plum curculio under eastern conditions, a single thorough spraying is about as efficient as a schedule of treatment requiring 3 or more applications; were these the only troubles to be considered, the orchardist would hardly be justified in making additional applications."

Attention is called to the fact that the value of a single spraying depends entirely upon the extent to which the calyx cups of the fruit are filled with the poison. It is stated that the necessity of filling the inner calyx cup with poison, as insisted upon by western entomologists, and the employment of a nozzle throwing a coarse spray, as the Bordeaux, has not been, on the whole, confirmed under eastern conditions. It appears that as good results follow the use of nozzles throwing a fine spray as where coarse nozzles are used.

"The practical utility of the one-spray method under eastern conditions is greatly lessened on account of the necessity in most regions of giving orchards additional applications of fungicides for the prevention of such diseases as apple scab, bitter rot, apple blotch, sooty blotch, etc. In regions where bitter rot and apple blotch are not troublesome, and in the case of varieties little susceptible to apple scab, the single application would be most likely to have value, and orchardists thus situated should determine the applicability of the method under their respective conditions. Where additional sprayings are necessary for fungus diseases, an arsenical should be added, as the additional cost is slight."

The importance of great thoroughness in spraying after the falling of the petals was developed during the studies, and is emphasized by the authors.

The efficiency of the driving spray, E. D. Ball (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 147–153*).—Following a brief consideration of methods recommended for codling moth study, the author presents a tabular summary of the results of driving spray tests in 1911 in which arsenate of lead at the rate of 5 lbs. to 100 gal. of water was used.

Even under extremely wormy conditions the 80 per cent of the worms that went into the calyx ends were practically all destroyed by one application, giving an efficiency of 99 or 100 per cent in every case. Even in the second brood with the number of worms increased many times, the lowest calyx efficiency was 95 per cent and the average alomst 98 per cent, while the total for the year was 99 per cent.

In experiments in which 2½ lbs. of lead arsenate was compared with 5 lbs. to 100 gal. of water, the difference in the number of worms which survived was small in the first brood but became much larger in the second brood where it was from 10 to 20 per cent. This is said to confirm previous experiments and to show that under wormy conditions 4 lbs. of lead arsenate to 100 gal. of water is the least that should be used.

Ortho-arsenite of zinc as an insecticide, R. A. Cooley (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 142–146, pl. 1*).—Used upon potatoes in combating the Colorado potato beetle, ortho-arsenite of zinc at the rate of 1 lb. to 50 gal. of water was as effective as Paris green, 1 lb. to 50 gal. of water, both being entirely satisfactory. Applied at the rate of 1 lb. to 75 gal. of water, however, it was not entirely effective. When used on cabbage, in combating the larvæ of the European cabbage butterfly and the diamond back moth, at a strength of 3 lbs. to 100 gal. of water, it was as effective as arsenate of lead at the rate of 6 lbs. to 100 gal. of water, and more satisfactory than Paris green, which, used at the rate of 1 lb. to 100 gal. of water, injured the cabbage plants through settling to the bottom of the knapsack sprayer. Tests made at the Montana Station are said to have shown neutral arsenite of zinc to be less injurious to the bark of the apple tree than any other arsenical compound used.

Grasshopper work in Minnesota during the season of 1911, F. L. Washburn (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 111–121*).—This is a summarized account of the work carried on in the western third and half of the southern part of Minnesota, where grasshoppers of various species have been increasing to such an extent that serious losses have been occasioned. All grains suffered, as well as timothy, corn, young trees in the nursery row, garden products, and particularly flax.

About 79 orthopterous species were collected and named. Of these species, only a comparative few were strikingly injurious, namely, *Melanoplus bivittatus*, *M. atlanis*, *M. femur-rubrum*, and *M. differentialis*, to which *Stenobothrus curtipennis* may possibly be added and, to a lesser extent, *Camnula pellucida*.

M. bivittatus, of secondary importance in 1909, was the most abundant of the injurious forms.

A mixture consisting of arsenite of soda 3 lbs., molasses 1½ gal., and water 180 gal., applied at the rate of 50 gal. per acre, was fatal to the grasshoppers and did not injure crops.

Modern warfare against grasshoppers, F. L. WASHBURN (*Pop. Sci. Mo., 81 (1912), No. 5, pp. 465–474, figs. 12*).—This is a discussion of the methods now in use in combating grasshoppers in Minnesota.

Grasshopper conditions in Colorado, C. P. GILLETTE (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 121–123*).—This paper sets forth the grasshopper conditions in Colorado.

The susceptibility of adults and eggs of pear psylla to spraying mixtures, P. J. PARROTT and H. E. HODGKISS (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 193, 194*).—It is stated that during 1911–12 growers freed their orchards of the pear psylla by spraying with miscible oils, homemade emulsions, or commercial nicotin preparations. See also a previous note (E. S. R., 25, p. 658).

Aphid pests of Maine.—Food plants of the aphids.—Psyllid notes, EDITH M. PATCH (*Maine Sta. Bul. 202, pp. 159–234, pls. 10, figs. 26*).—The first paper here presented (pp. 159–178) consists of notes on 17 aphid pests occurring in Maine on conifers and certain other plants and includes descriptions of 2 species new to science, namely, *Lachnus curvipes*, which is not uncommon on the balsam fir (*Abies balsamea*) and *Aphis abbreviata*, which occurs on the leaves of water-plantain (*Alisma plantago-aquatica*), both at Orono. A new genus, Neoprociphilus, is erected for *Pemphigus attenuatus* of Osborn and Sirrine.

The second paper (pp. 179–214) is Part I of a Food Plant Catalogue of the Aphidæ of the World.

The third paper (pp. 215–234) consists of Notes on the Psyllidæ, of which 16 species are described as new to science.

Utilization of fungus parasites of Coccidæ and Aleurodidæ in Florida, J. R. WATSON (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 200–204*).—This is a brief statement of the present status of the subject. See also a bulletin by Morrill and Back (E. S. R., 27, p. 860).

The cotton worm or caterpillar (Alabama argillacea), W. E. HINDS (*Alabama Col. Sta. Bul. 164, pp. 139–160, figs. 13*).—This is a general account of the cotton leaf worm, including its life history and habits and remedial measures. In the outbreak of 1911, 66 of the 68 counties of Alabama had been practically stripped by the worms before the end of the season. Careful field studies combined with reports received from all counties indicated that Alabama alone suffered a reduction of between 120,000 and 175,000 bales with an estimated damage of more than $7,000,000.

The outbreak of Alabama argillacea in 1911, W. D. HUNTER (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 123–131*).—These data are included in a paper previously noted (E. S. R., 27, p. 556).

Papers on deciduous fruit insects and insecticides.—Life history studies on the codling moth in Michigan, A. G. HAMMAR (*U. S. Dept. Agr., Bur. Ent. Bul. 115, pt. 1, pp. 86, pls. 3, figs. 22*).—This paper brings together the results of a detailed study of the life history of the codling moth made during 1909, 1910, and 1911 at a temporary field station at Douglas, Mich.

It was found that in Michigan one full brood and a partial second are produced. "In the field the earliest moths of the spring brood commence to appear from 5 to 10 days after the apple blossoms drop, and the earliest larvæ of the first brood hatch from 3 to 4 weeks after the petals drop. The earliest larvæ of the second brood hatch from 10 to 11 weeks after the petals drop. During

exceptionally warm and forward seasons the second-brood larvæ may appear considerably earlier, and were, in 1911, observed 8 weeks after the petals dropped. This record, however, should be considered very exceptional. . . .

"Egg deposition commenced in the cages from 3 to 9 days after the emergence of the moths, and most of the eggs were laid within 5 days after egg deposition commenced. In one instance eggs were laid 23 days after the emergence of the moth, but as a rule the great majority of the eggs were laid within 8 days of the emergence. The number of eggs per female varied considerably in the cages—on an average, 57 eggs per female were obtained. A single female deposited 161 eggs. Under normal conditions in the field the average number of eggs is unquestionably higher and probably approaches 80 to 90 eggs per female. The average length of life of the moths was found to be 9 days for the males and 11 days for the females. Instances occurred when one male lived 32 days and a female lived 37 days. The length of the incubation period of the eggs varied greatly under different temperature conditions. For the first brood the average length was 7 days and for the second brood 8 days. The range of variation extended from 4 to 16 days. . . .

"The length of the feeding period of the larvæ of the first brood varied from 17 to 45 days and averaged 25 days for the 'transforming' larvæ and 28 days for the 'wintering' larvæ. Still larger variation in the length of feeding was observed in the second brood, ranging from 20 to 84 days and averaging 36 days. On an average the larvæ spun their cocoons and pupated in 7 days. This period varied, however, from 3 to 18 days.

"The pupal stage varied greatly under different temperature conditions. . . . The average length of the pupal stage was 18 days and ranged from 1 week to 2 months. The length of the first generation, from the time of the appearance of the eggs to the time of emergence of the moths that resulted from the same, averaged 51 days in 1910. During 1911 the duration of the life cycle varied from 29 to 87 days and averaged 50 days.

"The relative abundance of first-brood and second-brood larvæ varied from year to year. In 1909 the second-brood larvæ . . . constituted 57 per cent of the larvæ for the season. During 1910, owing to the wide-felt scarcity of apples, the second brood only reached one-third the number of the first brood. During 1911 the second brood almost approached the first brood in abundance. Of the first-brood larvæ only a portion transformed the same season, while the other portion passed the winter in the larval stage. During the 3 years of observation the ratio between transforming and wintering larvæ of the first brood varied from 30:70 per cent to 51:49 per cent, respectively, and averaged 36 per cent transforming larvæ and 64 per cent wintering larvæ. The larvæ of either brood shed the skin (molted) 5 times, and had thus 6 instars. A limited number of larvæ molted only 4 times.

"A hymenopterous fly, *Ascogaster carpocapsæ*, was found to parasitize from 6 to 7 per cent of the larvæ of the codling moth. Hibernating codling-moth larvæ succumb extensively to the cold during the winter."

The results of this investigation in Michigan showed that poison-spray applications are most effective when applied at the following periods: First, shortly after the petals drop, to fill the open calyx cup and thus destroy the larvæ which hatch later; second, from 3 to 4 weeks after the petals have dropped, when the first-brood larvæ commence to hatch; third, 10 weeks after the petals have dropped, when under normal seasons the first larvæ of the second brood commence to appear. During advanced seasons the appearance of the second brood may be as early as 9 weeks and only very exceptionally 8 weeks after the petals have dropped, as noted in 1911.

The gooseberry gall midge or bud deformer (Rhopaloymia grossulariæ), J. S. HOUSER (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 180–184, pls. 2*).—The gooseberry gall midge is a new pest which first came to attention during the summer of 1906 on a farm at Camp Chase, Ohio, and is not known to occur elsewhere.

The gooseberry is seriously injured by the larvæ, which develop in the terminal buds of spurs and branches, causing the buds to become abnormal both in size and structure. The bud scales increase greatly in numbers and size and, lying closely one upon another, form a gall somewhat resembling in miniature the pine-cone willow galls so commonly encountered upon the tips of willow twigs. The injured bud is incapable of producing normal leaves and the plant, striving to maintain itself, develops secondary buds within or about the first. These in turn become infested and there is formed ultimately a large knot or cluster of galls.

The adults are said to appear during the early part of May, the eggs being deposited within a few hours after emergence and hatching apparently within a few days. The transformation from the larval to pupal stage is said to take place about April 1. The remedy consists in cutting out and burning the gall clusters during the fall or winter.

The time when wheat should be sown to escape the fall brood of Hessian fly, T. J. HEADLEE (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 98–109, figs. 2*).—The author discusses the existence of a ratio between the difference existing between the theoretical and actual dates of safe sowing and the variation in the normal annual precipitation. The ratio appears to be about 1 day to the inch, being 1 day earlier if the rainfall is 1 in. greater and 1 day later if 1 in. less. It is considered quite probable that this ratio may not hold where the precipitation reaches more than 40 in., but it must be taken into consideration where the rainfall is 40 in. or less.

Some problems of mosquito control in the Tropics, A. H. JENNINGS (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 131–142*).—Papers relating to this subject by Darling have previously been noted (E. S. R., 24, pp. 660, 755; 27, p. 265).

The Mediterranean fruit fly (Ceratitis capitata), A. L. QUAINTANCE (*U. S. Dept. Agr., Bur. Ent. Circ. 160, pp. 25, fig. 1*).—This summarized account of our knowledge of the Mediterranean fruit fly, which has recently become established in Hawaii, includes accounts of its destructiveness, life history and habits, natural enemies, and preventive and remedial measures.

A bibliography of the more important literature is appended.

The manipulation of the wax scales of the honey bee, D. B. CASTEEL (*U. S. Dept. Agr., Bur. Ent. Circ. 161, pp. 13, figs. 7*).—This paper, based upon observations made during the summer of 1911 at the apiary of the Bureau of Entomology, presents an account of the manner in which the scales of wax are transported from their pockets to the comb and points out some of the causes which lead to diversity in scale number and scale form.

The author finds that usually the scales are removed by the bee which secretes them and by this bee are masticated and added to the comb. The workers never assist each other in the process of removal, although free scales may, in some cases, be handled by other workers. As a rule, the scales are removed while the bee is standing on the comb or its support, and the wax thus obtained is applied to the comb near the place where it is removed.

"Scales which are removed accidentally or which are dropped during manipulation may be recovered later and built into the comb, but the recovery of free scales is usually not accomplished by the bee which secreted them. Bees which are producing wax may also rework the masticated wax laid down by others. Producing bees may turn to the work of building and sculpturing the comb

either before all their scales are removed or immediately after this has been accomplished."

Parasites of the family Dryinidæ, R. C. L. PERKINS (*Hawaiian Sugar Planters' Sta., Ent. Bul. 11, 1912, pp. 5–20, pls. 4*).—This paper is supplementary to those previously noted (E. S. R., 17, p. 477; 19, p. 57). Ten species are described as new to science, a large portion of which were reared from leafhoppers.

Two encyrtids, namely, *Echthrogonatopus hawaiiensis*, reared from *Pseudogonatopus perkinsi* and *Cheiloneurus javanus*, parasitic on Paradryinus, are also described as new to science.

Studies on the biology of the Texas fever tick, H. W. GRAYBILL and W. M. LEWALLEN (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 152, pp. 13*).—This report gives the results of studies made during 1908–9 in continuation of those previously noted (E. S. R., 25, p. 564).

The pear-leaf blister-mite, J. R. PARKER (*Montana Sta. Circ. 16, pp. 115–118*).—A brief popular account of *Eriophyes pyri*, with control measures.

FOODS—HUMAN NUTRITION.

Studies on chicken fat (*U. S. Dept. Agr., Bur. Chem. Circ. 103, pp. 12*).—Three papers are included.

Influence of temperature on the lipolysis of esters, Mary E. Pennington and J. S. Hepburn (pp. 1–3).—Since, as shown by earlier work (E. S. R., 25, p. 767), the acidity of the crude fat increases and the lipase retains its activity in chickens kept at varying temperatures and for varying periods of time after being killed, studies were undertaken to ascertain the influence of temperatures on the lipolysis of esters. Several fat old fowls were killed, cooled, and kept in a refrigerator for 7 days to permit the lipase to become active. An aqueous solution was prepared, toluol being used as a bactericide. The samples were incubated in an incubator at 40° C., in a refrigerator at 15.6 to 20.6°, in a mechanically refrigerated chill room at 0°, and in a mechanically refrigerated freezer at —9.4 to —6.7°, the period of incubation varying between the extremes of 3 days in the incubator and 151 days in the freezer.

"The greatest splitting of the esters by the lipase took place in the incubator, the least in the freezer, and between these two extremes lay the splitting in the refrigerator and in the chill room. . . .

"Although the rate of lipolysis is decreased by a lowering of the temperature, yet lipolysis takes places even at the temperature of the freezer when the reaction mixture is frozen solid."

The hydrolysis of chicken fat by means of lipase, Mary E. Pennington and J. S. Hepburn (pp. 4, 5).—Since lipase occurs in the crude fat of chickens and gives rise to the post-mortem hydrolysis of fat, tests were made to determine the extent of lipolysis of chicken fat in vitro. As shown by the increased acid value, due to the action of lipase, lipolysis took place when a glycerol extract of chicken flesh freed from crude fat by extraction with ether was incubated. When glycerol extract with water added was incubated, the increase in acid due to the action of lipase was more marked. "The glycerol extract by itself gave rise to an increase in acid value of only 0.33, whereas the glycerol extract plus its own volume of water gave rise to an increase in acid value of 0.56. In other words, in the more favorable reaction mixture the same quantity of lipase produced 1.7 as great an hydrolysis as in the less favorable substratum."

The occurrence of catalase, oxidases, and reductases in the fat of the common fowl (Gallus domesticus), J. S. Hepburn (pp. 6–12).—According to the

author's experiments here briefly reported, catalase and lipase always occur in the crude fat of chickens. The activity of the catalase is apparently more or less independent of the period of keeping of the chicken after death. Oxidases always occur in the crude fat, peroxidases usually and probably always occur, and reductases may occur.

A study of the enzyms of the egg of the common fowl, MARY E. PENNINGTON and H. C. ROBERTSON, Jr. (*U. S. Dept. Agr., Bur. Chem. Circ. 104, pp. 8*).—Fresh eggs, fertilized and unfertilized, stale eggs, and eggs of known history kept for varying lengths of time under definite conditions were used, experiments being made to determine the presence of pepsin, trypsin, lipase, catalase, and reductase.

The results, according to the authors' conclusions, show that "the lipase content of fresh eggs is quite low and it shows a fairly regular increase as the egg deteriorates. In the case of incubated eggs the increase in lipase content with incubation is more noticeable in the case of fertile eggs than in the case of the infertile, although in both cases it is very evident. Market eggs of unknown history, as we might expect, show considerable variation in lipase content. Storage eggs, after 2 months at 32° C., showed an increase in lipase, although at the end of another month there had been no further increase.

"A number of determinations were made of the catalase content of incubated eggs both fertile and infertile. The increase in catalase is great in the first case and far less in the second; in fact, in some cases infertile eggs, heated for several weeks, showed little more catalase than the average for the fresh eggs, while fertile eggs, at the end of a week, showed a catalase content ten times as great.

"The catalase content of fresh eggs is somewhat variable. . . . There is evidence, although it is not conclusive, that in the fresh fertile egg it is higher than in the fresh infertile egg, the eggs obtained in spring showing a higher enzym content than autumn eggs. The former were found to be about 90 per cent fertile, while the latter were nearly 60 per cent infertile. Again, the factor of the strength and vigor of the hen in the early spring months may affect the catalase content of the egg. It is generally conceded that early eggs give strong chicks, and they are also most desirable for storage purposes. More work on this phase of the problem is highly desirable.

"In the case of market eggs of unknown history the catalase content is naturally variable. Storage eggs, after several months at 32° C., showed a slight increase.

"Several experiments have indicated that the greater proportion of catalase is in the white of the egg, although it is not absent from the yolk. This will be further investigated.

"Several determinations were made of the catalase content of canned eggs, put up under excellent conditions and hard-frozen for several months. In general, the amount present was not greater than in the fresh egg.

"The amount of loosely bound nitrogen in incubated eggs, as determined by the Folin method [which is of value in determining the progress of deterioration of eggs as well as of flesh], shows an interesting change. In the case of infertile eggs a very noticeable and quite regular increase takes place with time, while in the case of the fertile eggs the increase is very slight. Considering the content of loosely bound nitrogen as a criterion of protein decomposition, this is not surprising, since in the first case heat would be expected to increase catabolic processes, making for simpler nitrogen compounds, while in the second case it introduces metabolic or upbuilding processes."

Ovomucoid and sugar in the white of birds' eggs, C. T. MÖRNER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 6, pp. 430–473*).—Domestic poultry and wild birds were used in this investigation.

Bob veal and the public, P. A. FISH (*Amer. Vet. Rev., 41 (1912), No. 2, pp. 178–185*).—Experiments are reported in which bob veal was compared with market veal and with beef in respect to freezing point, specific gravity, and percentage of water.

The freezing point method seemed more sensitive and reliable than the other methods tested. Comparing averages, it was found that the freezing point of bob veal up to 14 days old was from 0.1 to 0.11° less than market veal and beef.

Although the experiments indicate "quite a satisfactory line of demarcation between the younger bob and older veal, there are occasional individual exceptions, and the method [of distinguishing between old and young veal] as yet can not, therefore, be declared infallible."

Dietetic experiments were also carried on in which bob veal was eaten in 7 families aggregating 20 individuals ranging from 2 to 60 years of age. "The statement that the flesh of bob veal has a laxative effect and induces diarrhea has not been confirmed in a single instance throughout our work. The health in all cases was apparently normal; nor did any family refuse a second helping when another carcass became available.

"In all veal there is a deficiency of fat as compared with beef. In bob veal this deficiency is naturally somewhat more pronounced, because fat is a result of growth and age under proper nutritive conditions. In the use of bob veal this deficiency may be overcome to a considerable extent by cooking the veal with pork or other fat."

The author is of the opinion that bob veal is in no way injurious when used as human food.

The existing legal restrictions regarding the sale of very young veal and the desirability of changes in such regulations are discussed.

The pickling and curing of meat in hot weather, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 24, pp. 22*).—Directions are given for pickling and curing meat, together with a number of recipes for cooking pork.

Studies of flour, I, R. FANTO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 4, pp. 269–274, figs. 2*).—Studies are reported of the proportion of the total nitrogen of wheat and rye flour which is soluble, and also the results of tests of the viscosity of water extracts.

Studies on wheat flour.—II, Artificial flour improvers, H. JESSEN-HANSEN (*Ztschr. Gesam. Getreidew., 4 (1912), No. 10, pp. 271–277*).—The different flour improvers which have been suggested are considered to owe any value they possess to the increase which they produce in the hydrogen ion concentration. Other conclusions confirm previous findings (E. S. R., 27, p. 166).

Report from food laboratory (*Ann. Rpt. Ind. Bd. Health, 29 (1910), pp. 222–296, fig. 1*).—Data are given regarding the examination of a number of samples of milk, ice cream, lard, and other materials.

Report of sanitary inspections (*Ann. Rpt. Ind. Bd. Health, 29 (1910), pp. 297–311, fig. 1*).—A progress report.

Notices of adulteration or misbranding (*Kentucky Sta. Food and Drug Bul., 1912, cases 5118–5249, pp. 49–144*).—These notices have to do with the adulteration and misbranding of bakers' materials, milk deficient in butter fat and containing added water, cream adulterated and deficient in butter fat, etc.

Report of industrial investigations in Basle, edited by S. BAUER (*Basler Volkswirtschaftliche Arbeiten. Stuttgart, 1911, vol. 2, pp. XX+315*).—This report contains two papers, and an introduction by S. Bauer.

The food of German laborers and its cost, H. Lichtenfelt (pp. 1–90).—This paper contains the results of an exhaustive study of the income and disbursements of laboring men of various occupations in different German provinces. Considering average values, the digestible protein varied from 61.3 to 89.2 gm. per man per day; the digestible fat and carbohydrates with the smaller amount of protein being, respectively, 64.2 and 551.6 gm., and with the larger amount of protein, 113.9 and 618.8 gm.

Consumption and increased prices discussed on the basis of Basle budgets, F. Krömmelbein (pp. 91–315).—A large amount of data is summarized and discussed.

The nutritive value considered from a biological standpoint of foodstuffs denaturalized by high temperature, A. Suljma (*Arch. Hyg., 75 (1912), No. 6–7, pp. 235–264, dgms. 8*).—Experiments undertaken to determine whether there were differences in the physico-chemical properties of food in its usual condition and denaturalized by heating at a high temperature which would affect the digestive processes led to the conclusion that gastric digestion was much slower with the cooked than with the uncooked fish (sardines). Differences were not observed, however, when digestion as a whole was considered.

Artificial digestion experiments showed that the cooked fish required a much longer time for digestion than the raw. The favorable effect of the enzyms present in the raw fish was considered. When the material was kept on ice its enzymic properties were retained for a long time without loss.

Autodigestion experiments with raw and cooked sardines are also reported.

Effects of fruit juices on metabolism, T. Laurenti (*Policlin., Sez. Med., 13 (1911), No. 12, pp. 549–568; Jour. Amer. Med. Assoc., 58 (1912), No. 6, p. 452*).—Except for a slight effect in the case of lemon juice the author did not find that fruit juices exercised any special influence on the amount of urine, its specific gravity, or the total ammonia output. However, in nearly every experiment and during the supplemental period the total nitrogen was increased and the uric acid considerably increased. The effect of fruit juices did not seem to be directly proportional to their acidity.

Experiments on the biological value and metabolism of protein.—III, The rôle of chlorin in protein metabolism, A. Jappelli (*Arch. Fisiol., 10 (1912), No. 2, pp. 129–149; abs. in Zentbl. Expt. Med., 1 (1912), No. 10, pp. 445, 446*).—Experiments with dogs showed that the chlorin metabolism on a ration supplying only the necessary quantity of chlorin was dependent upon the character of the food, even though the chlorin content varied slightly.

Experiments on the biological value and metabolism of protein.—IV, Are serum proteid bodies the normal nitrogenous tissue nutrients? G. Quagliariello (*Arch. Fisiol., 10 (1912), No. 2, pp. 150–174; abs. in Zentbl. Expt. Med., 1 (1912), No. 10, pp. 446, 447*).—According to the author's conclusions, serum proteid as such is not sufficient to maintain the normal tissue metabolism.

The action of gastric juice on zein and gliadin, II, S. Baglioni (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 19 (1910), I. No. 8, pp. 512–517; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 12, p. 696*).—According to the artificial digestion experiments reported, zein shows a much greater resistance to digestion than gliadin. Gliadoses by long-continued action of gastric juice are changed into complicated bodies, while zeoses remain unchanged. See also a previous note (E. S. R., 20, p. 663).

Concerning fat metabolism, E. Freudenberg (*Biochem. Ztschr., 45 (1912), No. 5–6, pp. 467–487*).—Autolysis of rabbit liver under aseptic conditions showed that neutral fat underwent a cleavage which was quantitative with a

fat content of 2 per cent. If heated the liver lost this property. Other organs showed the same property but in much less degree, so, according to the author, the liver has a special place in fat metabolism.

Data are also reported regarding the fat content of the blood.

The antineuritis bases of vegetable origin in relationship to beri-beri, with a method of isolation of torulin, the antineuritic base of yeast, E. S. EDIE ET AL. (*Bio.-Chem. Jour., 6 (1912), No. 3, pp. 234–242*).—The authors studied rice bran and Katjang beans, the former giving somewhat favorable results, while the attempt to isolate an active substance from the beans which would possess curative effects in pigeons disabled with polyneuritis from rice meal feeding proved unsuccessful.

Natural yeast having been found previously to possess marked preventive and curative properties, extracts from yeasts were next investigated, and the authors succeeded in isolating an organic compound in the form of fine feathery crystals for which the following formula is suggested: $N(CH_3)_3.C_4H_7O_2.(HNO_3)$. This substance, which they propose to call torulin, showed marked antineuritic properties. It is proposed to investigate the material further.

Calorimetric observations, G. LUSK (*Med. Rec. [N. Y.], 82 (1912), No. 21, pp. 925–928, fig. 1*).—From respiration calorimeter experiments with a dog, quiet or sleeping, and excluded from thermal influences, the following general conclusions were drawn regarding metabolism:

There was found "a basal metabolism when the cells are nourished by a blood stream which does not receive food from the intestinal tract and the composition of which is regulated by the organs of the body; a metabolism due to plethora induced by an increased quantity in the blood of carbohydrate or fat metabolites which are being absorbed from the intestines; a metabolism due to the stimulus of incoming amino acids acting upon the cells.

"The metabolism of plethora and the metabolism of amino acid stimulation can not be added to each other; there is no summation of effect when both influences are brought into action together. In other words, cellular activity induced by the presence of carbohydrate is not further intensified by the stimulus of amino acids unless the latter alone would accomplish the result.

"The height found for the basal metabolism of the perfectly quiet resting organism, excluded from thermal influences and determined 18 hours after the ingestion of food, confirms Rubner's law of skin area, but places the heat elimination at a lower level."

The heat production per square meter of surface area in one dog was found to be 759 calories, calculated as for a period of 24 hours, and in another 784 calories. In a dwarf 17 years old and weighing 21.3 kg. it was 775 calories.

"In sleeping infants, however, the basal metabolism reached 1,100 calories per square meter of surface, and here the metabolism was also shown to be especially sensitive to protein ingestion (amino acid stimulation), indicating that a high metabolism is characteristic of youthful protoplasm.

"As a practical conclusion of these experiments, it appears that in a quiet and resting animal the heat production is increased by about 20 per cent after the ingestion of a mixed diet, and this increase continues during the period of intestinal absorption; also addition of moderate amounts of protein to the diet has little effect upon the production of heat, even though this protein given alone would of itself cause a considerable rise in the heat production. Hence, a mixed dietary is physiologically economical.

"Experiments are soon to be undertaken to establish the validity of the conclusions set forth in this paper as regards man both in health and disease."

ANIMAL PRODUCTION.

Yearbook of scientific and practical animal breeding, edited by G. WILSDORF and R. MÜLLER (*Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911) pp. VII+488, figs. 32*).—Part 1 of this yearbook contains articles by Bormann and Balzer, previously noted (E. S. R., 26 pp. 471, 667), and articles by Iwanoff and Becker (noted below). Part 2, as usual, consists of abstracts of articles on zootechny, and part 3 includes miscellaneous notes on various matters of interest to breeders of live stock.

The zoological garden of F. Falz-Fein, E. IWANOFF (*Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911), pp. 30–52, figs. 18*).—This is an account of hybrids between *Equus chapmanii* and *E. caballus*, *E. caballus* and *E. przewalskii*, *Bos taurus* and *Bison americanus*, and *Bos taurus* and *Bison bonasus*.

Evidence of alternative inheritance in the F_2 generation from crosses of Bos indicus on B. taurus, R. K. NABOURS (*Amer. Nat., 46 (1912), No. 547, pp. 428–436, figs. 9*).—This is a preliminary report on crosses of *B. indicus*, imported to Texas, with other breeds of cattle. The color patterns of the Herefords and Durhams were dominant in the F_2 generation. It is thought that the hump, large sheath, and dewlap of the zebu follow the law of alternative inheritance when the parent strains are pure. The hybrids are about 50 per cent larger than the ordinary native range cattle.

Correlation between the lung, heart, and size and weight of the body in Simmental and Oldenburg breeds of cattle, W. BECKER (*Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911), pp. 53–114*).—The author gives the results of measurements made of living and slaughtered animals. A bibliography is appended.

Fancy points in animal breeding, E. N. WENTWORTH (*Country Gent., 77 (1912), No. 41, p. 6, fig. 1*).—It is pointed out that too much attention has been paid to fancy points in breeding animals, although some cases are cited in which they are associated with economic qualities.

Regeneration and related processes, D. BARFURTH (*Fortschr. Naturw. Forsch., 6 (1912), pp. 153–142*).—This reviews investigations on the regeneration of tissues, lost organs, transplantation of tissues, and their relation to the embryonic growth of new individuals. A bibliography of over 400 titles is appended.

The action of adrenalin and cholin on the determination of sex, R. ROBINSON (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 24, pp. 1634–1636*).—A continuation of earlier work (E. S. R., 26, p. 773).

The author found that subcutaneous injections of adrenalin hydrochlorid increased the proportion of males in guinea pigs. Adrenalin caused a reduction and cholin an increase in the weight of the animals treated. Several cases in humans are reported in which it is claimed that sex could be determined by the presence or absence of adrenalin in the urine of the parent.

The influence of standing or lying upon the metabolism of cattle, H. P. ARMSBY and J. A. FRIES (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 23–33*).—A preliminary report of results of testing new appliances devised in order that separate determinations of carbon dioxid and water vapor might be made in the intervals of standing or lying. The average percentage of increase in standing over lying was as follows: Carbon dioxid 31.3, water vapor 33.1, total heat 36.2, and radiated heat 37.2 per cent. The influence of standing or lying upon the excretion of carbon dioxid was much greater than in experiments observed by Hagemann or Dahm.

It is concluded that the increased heat emission by cattle during standing, which has been invariably observed in these experiments, represents substantially the increased heat production during the same time.

The combustible gases excreted by cattle, J. A. FRIES (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 109–119*).—This contains results of 57 respiration calorimeter experiments with steers.

There was a great variation in the daily quantities of hydrogen and carbon given off in the form of combustible gases, ranging from 5.445 gm. of hydrogen and 19.477 gm. of carbon to 49.152 gm. of hydrogen and 150.697 gm. of carbon. There was also a great variation in the ratio of hydrogen to carbon, the average being 1 : 3.167. The bulk of the feed and the length of time which it remained in the animal's body, especially in the rations containing alfalfa hay, appeared to influence the composition of the combustible gases produced.

"The amount of combustible gases increases with increase in quantity of feed eaten. The production of combustible carbon is relatively greater with the smaller rations. In percentage of the total carbon given off in carbon dioxid, the combustible carbon increases with the increase in the rations. The individuality of the animals does not seem to have any marked influence upon the production of combustible gases. A tendency for higher percentage of carbon to hydrogen is noticed with the smaller rations, but this is especially marked in the rations containing alfalfa hay."

Composition and digestibility of ether extract of hays and fodders, G. S FRAPS and J. B. RATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 105–107*).—"The ether extract of hays and fodders contains on an average 58 per cent unsaponifiable material, chiefly wax alcohols. The unsaponifiable material is digested to a much less extent than the saponifiable matter, which includes chlorophyll and fatty acids. The low digestibility of the ether extract of hays and fodders is due largely to the presence of large proportions of nonfats, which are not as easily digested as the fats."

Composition and digestibility of the chloroform extract of plants, G. S. FRAPS and J. B. RATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 103, 104*).—"The chloroform extract of hays and fodders is about 60 per cent as much as the ether extract previously made on the same samples. The chloroform extract consists largely of chlorophyll and other weak acids, though it contains fatty acids and wax alcohols also. The chloroform extract has a higher digestibility than the ether extract."

Steer feeding in Alabama, D. T. GRAY and W. F. WARD (*Alabama Col. Sta. Bul. 163, pp. 57–133, figs. 11*).—This bulletin, which reports results of feeding experiments conducted under actual farm conditions in Sumter County, Ala., by the Alabama Station in cooperation with the Bureau of Animal Industry of this Department, is divided into 4 parts.

I. *Winter fattening of steers on cotton-seed meal, cotton-seed hulls, corn silage, and Johnson-grass hay* (pp. 59–77).—In an experiment during the winter of 1909–10 60 grade Hereford, Aberdeen-Angus, and Shorthorn steers from 2 to 3 years old were fed for 84 days. During the first 28 days each lot received a daily ration of 4.64 lbs. of cotton-seed meal per head, which was increased to 6 lbs. for the next 28 days and to 7.73 lbs. for the last 28 days. In addition all lots were fed cotton-seed hulls during the whole period, and for the first 56 days lot 1 was fed corn silage and lot 2 Johnson-grass hay for the full period. At the end of 56 days, when the silage supply gave out, the average daily

gain per head for the silage-fed steers was 1.86 lbs., which was made at a cost of 7.98 cts. and a consumption of 2.87 lbs. of cotton-seed meal per pound of gain. The lot fed Johnson-grass hay had gained 1.43 lbs. each daily at a cost of 11.88 cts. and a consumption of 3.72 lbs. of cotton-seed meal per pound of gain. The lot fed the cotton-seed meal and hulls had gained 1.89 lbs. each daily at a cost of 8.8 cts. and a consumption of 2.8 lbs. of cotton-seed meal per pound of gain. For the whole 84 days the daily gains per head were for lot 1, 1.8 lbs.; lot 2, 1.54 lbs.; and for lot 3, 1.71 lbs.

II. *Wintering steers preparatory to summer fattening on pasture* (pp. 78–105).—In continuation of work previously noted (E. S. R., 25, p. 72) 2 experiments are here reported. In the first, 35 2-year-old grade Shorthorn and Aberdeen-Angus steers weighing about 616 lbs. each were used. The winter rations, which were intended to carry the steers through in condition to be fattened in summer, were for lot 1, 2.35 lbs. cotton-seed meal and 13.29 lbs. cotton-seed hulls each daily, and for lot 2, 2.35 lbs. cotton-seed meal, 6.82 lbs. cotton-seed hulls and 5.5 lbs. Johnson-grass hay. On these rations for 116 days the steers in lot 1 made an average daily gain of 0.64 lb. each at a cost of 12.05 cts. per pound, and those in lot 2, 0.59 lb. at a cost of 14.71 cts. per pound. In the spring of 1910 these 2 lots were combined and fattened on a sandy loam pasture that afforded an abundance of grass. In addition to pasturage they were fed per head per day 2.19 lbs. cotton-seed cake at the beginning which was gradually increased to 6 lbs. toward the end of the period. During this period, 147 days, the steers made an average daily gain of 1.14 lbs. each at a cost of 7.06 cts. per pound. For the whole period, winter and spring, the steers of lot 1 were fed at a loss of $4.97 each, and those of lot 2 at a loss of $5.95 each.

In another test 43 common steers of the neighborhood from 3 to 4 years old weighing 565 lbs. each were used. These steers cost in the fall of 1909 $2.25 per hundredweight. During the winter they had the run of a 20,000-acre range and received no additional feed. Under these conditions they made an average daily gain of 0.08 lb. each. At the close of this period these steers were divided into 2 lots and fattened on pasture for the late summer market. In addition to pasturage lot 1 was fed 2.84 lbs. cotton-seed cake each daily, which was gradually increased to 5 lbs. toward the close of the period; lot 2 received nothing in addition to pasturage. During this period, 113 days, lot 1 made an average daily gain of 1.42 lbs. each at a cost of 4.82 cts. per pound, and lot 2, 1.33 lbs. each at a cost of 1.55 cts. per pound. A profit of $6.97 per steer was realized on lot 1 and $11 per steer on lot 2. In figuring the cost of gains, profits, and losses, cotton-seed meal and cake were charged at $26 each, cotton-seed hulls $7, and Johnson-grass hay $11 per ton; pasturage 50 cts. per steer per month, and range nothing.

III. *The value of shelter for fattening cattle in Alabama* (pp. 106–116).—A report of feeding experiments conducted during the winter of 1910–11. In continuation of work already noted (E. S. R., 19, p. 1067) a mixed lot of 67 steers, heifers, and cows of poor quality from 2 to 4 years old were divided into 2 lots. Lot 1 was confined in a small inclosure across one side of which extended an open shed, and lot 2 was fed on a 5-acre tract of sandy land with no shelter. The rations for each lot were cotton-seed meal and hulls, about 4½ lbs. meal per head daily being fed at first, which was gradually increased to about 5½ lbs. with no ill effects. The test lasted 103 days. The cattle in lot 1 gained 1.71 lbs. each daily at a cost of 7.66 cts. per pound, and made a profit of $6.88 each. Those in lot 2 gained 1.67 lbs. each daily at a cost of 7.72 cts. per pound and made a profit of $7.48 each, cotton-seed meal being charged at $26 and hulls at $7 per ton.

IV. *Early compared with late fattening of steers on pasture* (pp. 117–133).—These pages report the results of feeding tests with 224 steers on pasture during the 3 years 1909–11. The steers were mostly grade Aberdeen-Angus, Shorthorn, Hereford, and Red Polled, though a few had a predominance of Jersey and scrub breeding. The steers in the long-fed lots were given from 2.21 to 2.88 lbs. of cotton-seed cake at the beginning of the tests, while those in the short-fed lots received from 3.24 to 3.40 lbs. each daily. At the close of the test each steer in the long-fed lots was consuming from 3½ to 4 lbs. of cake, while those in the short-fed lots were consuming an average of 5 lbs. daily. An abundance of pasture was supplied for each lot, the short-fed steers being put on pasture and marketed earlier than the long-fed steers. The following table gives some of the results obtained:

Summary of 3 years' tests in fattening steers on pasture.

SHORT-FED STEERS.

Number of steers.	Length of feeding period.	Year.	Average initial weight of steers.	Average daily gain.	Cost per pound gain.	Profit per steer.
	Days.		*Pounds.*	*Pounds.*	*Cents.*	
35	140	1909	723	1.96	3.76	$8.25
30	91	1910	668	2.21	3.32	9.90
25	128	1911	661	1.96	4.02	6.81
90	.....	3-year, average.	.....	2.04	3.69	8.30
LONG-FED STEERS.						
75	154	1909	639	1.88	3.24	$6.91
34	119	1910	576	1.96	3.24	11.00
25	140	1911	565	1.72	3.70	6.48
134	.....	3-year, average.	.....	1.87	3.33	7.73

Feeding beef cattle in Alabama, D. T. Gray and W. F. Ward (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 159, pp. 56*).—This comprises, with slight changes, the text of the bulletin noted above.

Cotton-seed meal and corn silage feeding experiments with beef cattle, R. S. Curtis (*North Carolina Sta. Bul. 222, pp. 115–132, figs. 5*).—In continuation of work already reported (E. S. R., 25, p. 873) results are here given of tests to determine the most profitable amount of cotton-seed meal to feed daily to beef cattle, and to compare further the relative value of cotton-seed hulls, corn stover, and corn silage when fed in connection with cotton-seed meal. In this test 35 western North Carolina steers, medium grade feeders about 2½ to 3 years old and mostly grade Shorthorns, were used. The preliminary feeding period lasted 40 days and the final period 122 days. The steers were divided into 5 lots of 7 steers each, and during the whole experiment no steer was off feed at any time. The preliminary rations consisted of roughage for the first 10 days, after which they were fed cotton-seed meal, cotton-seed hulls, corn stover, and oat hay, the cotton-seed meal being gradually increased until 1 week before the beginning of the test, when all lots were put on the experimental rations. During the final period the daily amounts of cotton-seed meal fed per steer were as follows: Lots 1, 3, and 5, 7.53 lbs.; lot 2, 6.05 lbs.; and lot 4, 9.07 lbs. In addition lot 1 received 26 lbs. of cotton-seed hulls; lots 2, 3, and

4, 12.7 lbs. corn stover and 13.8 lbs. silage; and lot 5, 30.6 lbs. silage per steer daily. In figuring profits the feeds were rated per ton as follows: Cotton-seed meal $26, cotton-seed hulls $6, corn silage $3, and corn stover $10. Manure was rated at $2 per ton. The initial value of the steers, 3.86 cts. per pound, was their actual cost in the mountains, and the final values were the estimates of 3 disinterested parties.

The following table gives some of the results obtained:

Summary of results from feeding beef cattle on various rations.

Lot.	Rations.	Initial weight per steer.	Average daily gain per steer.					Cost per pound of gain.	Final valuation of steers, per pound.	Manure produced.	Profit per steer.
			First month.	Second month.	Third month.	Fourth month.	Whole period.				
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lb.*	*Lbs.*	*Cts.*	*Cts.*	*Tons.*	
1	Cotton-seed meal and hulls	945.7	2.28	2.24	0.54	0.01	1.28	13.74	5.50	47.19	$2.65
2	Cotton-seed meal, stover, and silage	919.3	1.45	2.19	1.56	.64	1.46	12.44	5.75	51.01	5.49
3	do	893.6	1.96	1.98	1.67	.80	1.60	12.54	5.75	50.86	3.63
4	do	905.0	1.77	2.49	1.33	.94	1.64	13.46	5.75	35.65	1.69
5	Cotton seed meal and silage	890.0	2.21	1.83	2.09	.64	1.69	9.87	6.00	42.11	11.11

It is stated that lot 1 had a dry, harsh condition at the finish, and that the other cattle, especially lot 5, had a smooth, mellow finish. "Because of the kind of rations and the way in which the preliminary feeds were given, the lot fed cotton-seed hulls for roughage had the advantage over all the other lots. No change was necessary in their ration, either in kind or quantity of feed at the beginning of the experimental period. This makes the results still more conclusive regarding the comparative value of the dry and succulent roughage feeds."

From these results the indications are that corn silage will almost replace cotton-seed hulls pound for pound at practically one-half the cost for roughage.

Winter steer feeding, 1909–10 and 1910–11, J. H. SKINNER, F. G. KING, and H. P. RUSK (*Indiana Sta. Bul. 153, popular ed., pp. 3–24*).—A popular edition of a bulletin previously noted (E. S. R., 26, p. 568).

Selecting steers for feeding, J. L. TORMEY (*Wisconsin Sta. Bul. 224, pp. 3–30, figs. 13*).—This bulletin deals in a practical way with the questions that arise with reference to the economical production of beef on Wisconsin farms. The points dealt with are the type of cattle to keep for beef, how to build up a beef herd, selecting feeding cattle, classes and grades of cattle on the market, how and when to get feeders, the feeding margin, the feeding period, hogs following steers, and marketing.

Lowering the cost of beef production, A. GOUIN and P. ANDOUARD (*Bul. Soc. Nat. Agr. France, 72 (1912), No. 6, pp. 489–497; Rev. Gén. Agron., n. ser., 7 (1912), No. 7, pp. 261–266*).—This contains data on the growth of calves up to 18 months of age, and discusses the most profitable age at which to slaughter.

Economic factors in cattle feeding.—I, Relation of the United States to the world's beef supply, H. W. MUMFORD and L. D. HALL (*Illinois Sta. Circ. 163, pp. 11, figs. 5*).—This circular, treating of the relation of the United States to the world's beef supply, is the first of a series which will deal with other aspects of the subject. The statistics given have been noted from other sources, and show that unless a rapid increase in cattle raising occurs in this country, exports of cattle must soon cease.

Sheep raising, R. S. CURTIS (*North Carolina Sta. Bul. 223, pp. 5–30, figs. 11*).—A popular presentation of the subject, in which breeds, care and management, and some of the common ailments of sheep are dealt with. Greater attention to this profitable industry in the Piedmont and mountainous regions of the State is urged.

Growing and marketing wool, W. C. COFFEY (*Illinois Sta. Circ. 161, pp. 16, figs. 8*).—Directions are given for the production of a desirable quality of wool in the condition most satisfactory to the market.

Hog raising for the Idaho farmer, W. L. CARLYLE and E. J. IDDINGS (*Idaho Sta. Bul. 74, pp. 3–31, figs. 9*).—This bulletin reports results of several feeding experiments testing the value of Idaho feeds for pork production, gives suggestions and practical information to the beginner, and outlines approved methods of management, including a floor plan of a hog house. The following table summarizes the results of the feeding experiments, the feeds being charged at the following prices per hundredweight: Ground wheat, $1.25; cracked corn, $1.40; wheat shorts, $1.10; rolled barley, $1.10; high protein tankage (60 per cent protein), $2; low protein tankage (34.64 per cent protein), $1.50; field peas, $1.50; and soy-bean meal, $1.90:

Summary of feeding tests with pigs.

Rations.	Number of pigs.	Weight of pigs.	Number of days in test.	Daily gain per pig.	Cost per pound gain.
		Lbs.		*Lbs.*	*Cts.*
Wheat, ground corn, shorts (2:1:1)	8	67.3	98	1.18	5.46
Wheat, ground corn, shorts, tankage (2:1:1:1)	8	75.5	98	1.38	5.84
Shorts, rolled barley, and ground corn (4:2:1)	12	74.5	105	1.26	5.96
Shorts, rolled barley, and field peas (4:2:2)	12	73.7	105	1.35	6.00
Shorts, rolled barley, and soy-bean meal (4:2:1)	12	71.9	105	1.28	6.06
Shorts, rolled barley, and tankage (60 per cent protein) (8:4:1)	12	72.6	105	1.40	5.59
Wheat and tankage (34.64 per cent protein) (11:1)	8	116.3	56	1.45	5.52
Wheat and soy-bean meal (11:1)	8	117.6	56	1.37	5.75

Hog management in Montana, R. W. CLARK and H. P. GRIFFIN (*Montana Sta. Circ. 13, pp. 55–77, figs. 8*).—This circular gives popular directions for the management of pigs, including housing, pens and pastures, maintenance and health of stock, and feeding.

Poultry raising in Macon County, Alabama, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 23, pp. 3–20, figs. 4*).—The purpose of this bulletin is to suggest ways and means for profitable poultry raising in Alabama. Special attention is given to different methods of feeding and avoiding the diseases most prevalent among fowls. The egg record and the expense account of a flock of Barred Plymouth Rocks are given.

Chick feeding, W. F. SCHOPPE (*Montana Sta. Circ. 18, pp. 6*).—An outline of the plan used by the Montana Station for feeding chicks, including grain mixtures for chicks of different ages, and directions for the preparation of a cresol solution for disinfecting brooders, incubators, etc.

Is there an egg type of the domestic hen? D. E. HALE (*Rel. Poultry Jour., 19 (1912), No. 5, pp. 782, 783, 828, 829, figs. 2*).—A description of the correlation between form and function of prolific layers.

Does feeding antimony to geese produce fatty liver? POPPE and POLENSKE (*Arb. K. Gsndhtsamt., 38 (1912), No. 2, pp. 155–161; abs. in Deut. Landw. Presse, 39 (1912), No. 7, p. 68; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 746, 747*).—From 1 to 2 gm. of

a mixture of pure antimony sulphid and ordinary antimony per head per day did not appear to affect unfavorably the condition of the birds. When antimony or arsenic was fed to geese small quantities could be detected in the livers, but the amount seemed to be influenced by the individuality of the bird. The size and weight of the liver were not affected.

[Report of the Association of Feed Control Officials] (*Amer. Hay, Flour, and Feed Jour., 22 (1912), No. 1, pp. 19–35, 44, figs. 8*).—This reports in full the proceedings of the meeting, noted on another page. The following papers were read: The president's address, by W. J. Jones, Jr. (pp. 19–21); report of the executive committee, by C. D. Woods (pp. 21, 22, 32–35); Cotton-seed Meals and Their Manufacture, by R. E. Stallings (pp. 22, 23); Gluten Feeds and Their Manufacture, by H. C. Humphrey (pp. 23–26); State Legislation Affecting Commercial Feeding Stuffs, by G. L. Flanders (pp. 26–28); Oat By-products: Their Value and Conservation, by F. D. Fuller (pp. 28–30); and Utilization of By-products, by C. S. Miner (pp. 30–32).

DAIRY FARMING—DAIRYING.

The feed unit system for determining the economy of production by dairy cows, F. W. Woll (*Wisconsin Sta. Circ. Inform. 37, pp. 15*).—This circular gives a brief description of the so-called "feed unit system" which has been developed in north European countries and is now extensively used there, and cites some results of the use of this system in compiling the results of the Wisconsin dairy cow competition. It is urged that the system be adopted by farmers in this country as a means of determining what feeds to grow and of weeding out unprofitable cows from the dairy herd. A table gives a comparison of therms, starch values, and feed units for a number of common feeding stuffs in which the figures for the therms and starch values have been recalculated to the same basis used in the feed unit system.

A short bibliography of feeding experiments in which this system has been used is given.

Dairying in Montana, R. W. Clark (*Montana Sta. Circ. 10, pp. 17–36*).—A popular discussion of the subject, including directions for computing balanced rations.

The average production per cow for 12 grade Shorthorn cows of the station herd in 1905 was 5,992 lbs. milk and 250 lbs. milk fat, and in 1906, 6,582 lbs. milk and 274 lbs. milk fat. In 1910 the 5 best cows averaged 10,889 lbs. milk and 410 lbs. milk fat each, and the 5 poorest cows 3,556 lbs. milk and 141 lbs. milk fat.

The Wisconsin dairy cow competition, F. W. Woll and R. T. Harris (*Wisconsin Sta. Bul. 226, pp. 3–36, figs. 15*).—This gives the details of the Wisconsin competition (E. S. R., 22, p. 577), in which 56 breeders and farmers entered 448 pure-bred and 58 grade cows, of which 395 made yearly records under the rules governing semiofficial yearly tests.

The net returns ranged from $154.44 profit to $6.10 loss per cow, not counting the labor, and averaged $62.85. Nearly two-thirds of the competing cows produced an average of over 400 lbs. of milk fat. The best cow (a Holstein) gave 21,972.9 lbs. of milk, containing 888.157 lbs. of fat. The first-prize herd of 10 cows averaged 16,044 lbs. of milk and nearly 600 lbs. of milk fat.

The Holsteins averaged more milk and milk fat and higher net returns per cow, but the Jerseys and Guernseys produced more milk fat for the amount of feed eaten. The production of the competing grade cows compared favorably with that of the pure breds and shows what improvement can be made by the use of a pure-bred sire.

Methods of classifying the lactic-acid bacteria, L. A. ROGERS and B. J. DAVIS (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 154, pp. 30, figs. 6*).—In view of the need felt by dairy bacteriologists and others of a classification of the lactic-acid bacteria into naturally related groups by means of characters that can be determined with reasonable accuracy and in a manner ordinarily available, a study was made of about 150 cultures isolated from milk, butter, and cheese, derived from various parts of the country, with the object of laying the basis for a satisfactory classification.

It is stated that no one basis of classification can be used for all groups of bacteria, but that certain fundamental principles should govern any method of arrangement, two of the most obvious being that the characters should be constant and that they should be so selected that they show real biological relationships.

With the cultures used in this study the morphology, Gram's stain, cell grouping, in many cases formation of capsule, the nature and amount of growth on lactose-agar slopes and in gelatin stabs, the rate of liquefaction of gelatin, the nature of growth in broth, growth in milk, the reduction of nitrates and of neutral red, and the formation of acid in broth containing various test substances were determined. In these fermentation tests the sugars lactose, dextrose, galactose, saccharose, and raffinose, the alcohols mannite and glycerin, and the polysaccharid inulin were used. The following conclusions are drawn:

"The stability of the fermentation tests is made evident not only by the constancy of the reactions on repeated tests, but also by the marked correlation between different fermentative activities and between the fermentations and other characters. The usefulness of these tests is only apparent when by means of biometrical methods the correlations are established and the cultures are arranged in groups possessing certain characters in common, but in which minor variations from the type are not excluded.

"The test substances used can not be determined arbitrarily. It is probable that it will be desirable to vary the test substances used with different groups of bacteria. We have found raffinose and glycerin and the gelatin test especially valuable, while saccharose, which has long been used for differential tests, has much less value. All of the groups have many cultures fermenting this sugar and there is little correlation with other reactions. While the determination of the fermentation of raffinose or glycerin gives one a good idea of the group in which the culture should be placed, the knowledge that a culture ferments or fails to ferment saccharose is of little assistance.

"It should be remembered that these cultures were all selected on the basis of the possession of a single positive character, the fermentation of lactose. If the collection had been made on a broader basis, it is highly probable that the cultures would have formed other groups around types distinct from those we have found, but related to them by certain common characters and by transition forms.

"The results recorded in this paper are too meager to warrant any attempt at fixing or establishing the place of the lactic-acid bacteria in the bacteriological system, but we believe that this work indicates that future efforts in the direction of systematic bacteriology should be toward the determination of those characters that are significant and enduring rather than in fruitless controversy over the priority or stability of some name based on descriptions so undeterminative that they convey no meaning."

A bibliography of 25 titles is included.

Care of milk in the home, B. R. RICKARDS and H. N. PARKER (*Illinois Sta. Circ. 162, pp. 6*).—Popular hints are given for the care of milk in the home, including brief directions for pasteurization.

The normal composition of American creamery butter, S. C. THOMPSON, R. H. SHAW, and R. P. NORTON (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 149, pp. 31, figs. 4*).—This bulletin reports results of a comprehensive study of the composition of normal American creamery butter and the conditions under which such butter is made. Complete analyses and churning data are given of 695 samples of creamery butter derived from 14 States. In making the analyses fat, water, and curd were determined according to the official methods, and the salt by a method devised by C. E. Gray, the details of which are given. The following table gives the average composition of the butter analyzed.

Average composition of 695 samples of American creamery butter.

Kind of butter.	Number of samples.	Water.	Fat.	Curd.	Salt.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Minnesota	223	13.60	82.81	1.24	2.34
Iowa	131	14.24	82.11	1.12	2.51
Wisconsin	117	13.77	82.48	1.14	2.61
California	95	14.19	82.12	1.05	2.64
Pennsylvania	37	13.53	82.81	1.03	2.63
North Dakota	17	13.63	82.40	1.15	2.81
Texas	15	13.98	82.76	1.11	2.15
Michigan	10	14.44	80.99	1.26	3.31
Made and packed for U. S. Navy	34	12.21	84.13	0.94	2.72
Average of all samples	695	13.90	82.41	1.18	2.51

A study of Idaho butter with suggestions for improvement, G. E. FREVERT (*Idaho Sta. Bul. 73, pp. 52, figs. 11*).—This bulletin points out the prominent defects in Idaho butter, and suggests ways for their prevention.

Analyses and scores of 49 samples of ranch butter and 50 samples of creamery butter are given. The average score of the ranch butter was 86.6 per cent, and for the creamery butter 91.1 per cent.

In studying the relationship between composition and score of the ranch butter it was found that low acidity, high salt content, and low casein content accompanied high scores, but no correlation was found between moisture content and score. These correlations were also observed in the creamery butter, except that between casein content and score. Moisture content and percentage of salt seemed to be closely related.

A study of the shrinkage of butter in prints is reported. With prints under stored conditions, placed 2 in. apart to allow circulation of air, the average shrinkage of butter in 1 week was as follows: Creamery, 1-lb. prints, 0.23 oz.; ranch, 1-lb. prints, 0.25 oz.; ranch 2-lb. prints, 0.27 oz. Brief notes are given on difficult churnings, controlling moisture in butter, and selling cream *v.* butter making on the ranch.

The manufacture of butter for storage, L. A. ROGERS, S. C. THOMPSON, and J. R. KEITHLEY (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 148, pp. 27, figs. 5*).—This is a study of 3 seasons' storage of butter made and packed for the United States Navy and 2 seasons' work with other butter manufactured under commercial conditions, to test thoroughly the effect of storage at various temperatures upon the keeping and commercial qualities of butter made by different methods.

The scores made by various samples of butter stored for 40 days at 0° F., 150 days at 0°, and 150 days at 20°, respectively, ranged with two exceptions above 90 for the butter made from cream with an acidity below 0.3 per cent, while those from cream of customary acidity were variable and usually below 90, this being especially true of the samples stored at 20°.

For several years the Navy Department has procured and stored its year's supply of butter during the period of heavy production. The butter has been made from pasteurized sweet cream, packed in hermetically sealed cans under the supervision and specifications of the Dairy Division of this Department, and held at zero or lower. The average yearly scores before and after storage of all Navy butter for 3 years were as follows: In 1909, 94.92 and 90.90; in 1910, 94.73 and 91.75; and in 1911, 94.75 and 92.37. In one creamery, which was allowed to disregard the acidity and pasteurization requirements of the specifications, butter churned from cream with an acidity of about 0.56 per cent scored originally 94.20 and after 8 months' storage 87.25, 90.7 per cent of all samples showing a pronounced fishy flavor. As compared with this, butter from a creamery which used pasteurized sweet cream had an original score of 94.69 and after 8 months' storage 92.33.

Under the direction of the Dairy Division creamery butter was made in Minnesota in 1910 and 1911 expressly for storage. In 1910 the butter was packed in June and early July, and removed from storage the next February. In 1911 the butter was packed in May and early June and removed from storage the next January. The following table gives the number of churnings and average scores before and after storage:

Average scores of creamery butter before and after storage.

Kind of butter.	Treatment of cream in 1910.			Treatment of cream in 1911.		
	Raw, ripened.	Pasteurized, ripened.	Pasteurized, unripened.	Raw, ripened.	Pasteurized, ripened.	Pasteurized, unripened.
	Score.	*Score.*	*Score.*	*Score.*	*Score.*	*Score.*
Fresh butter	92.33	93.35	92.94	93.55	93.52	94.61
Stored at 0° F	87.33	91.20	92.36	91.86	91.74	94.18
Stored at 10°	86.94	90.28	91.91	89.48	89.91	93.16
Stored at 20°	86.33	88.47	91.41	89.88	89.64	92.88

It is stated that the difference in scores of butter stored at zero and 10° is sufficient to warrant the use of the lower temperature even for butter of the best keeping quality. However, at 20° the deterioration of the sweet-cream butter was comparatively slight, indicating that this butter would retain its flavor well after removal from storage, and again demonstrating the superiority of butter made from pasteurized sweet cream.

A study of the gases of Emmental cheese, W. M. Clark (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 151, pp. 32, figs. 5*).—This bulletin reports in detail the results of experimental work concerning the chemical contents of the so-called "eyes" of Swiss or Emmental cheese and discusses the cause of eye formation, a brief report of which has been previously noted (E. S. R., 26, p. 775). An apparatus devised for the collection over mercury of the gas from the eyes of cheese is described and illustrated, as is also an apparatus devised for the collection of gas from "pinholes" and from the body of the cheese. Anaylses are reported of gas collected from a number of Emmental cheeses by these 2 methods, and the results discussed in the light of the literature on the subject.

As a result of tests for the presence of hydrogen it is stated that hydrogen plays no rôle in the formation of normal eyes in cheese. Other experiments are given which refute the contention that, in the analysis of gas in the eyes, hydrogen escapes detection because of its rapid diffusion out through the cheese. The absence of an appreciable amount of oxygen and the presence of

large percentages of nitrogen in these analyses led to a study of the diffusion of air into cheese with absorption of oxygen. By the use of a diffusion apparatus, which is illustrated and described, and small disks of cheese taken from sound portions of freshly cut cheese, every precaution being used in cutting and handling to prevent breaking of the texture, no apparent diffusion of either air or carbon dioxid occurred during an hour. The same impermeability for air was observed during an experiment lasting several days. Further tests in which diffusion was induced by a mercury pump were made and showed remarkable impermeability of Emmental cheese and practically the same result with Cheddar cheese. It is stated that the permeability of cheese to gases is probably due to the diffusion of dissolved gases, and that as the free solvent becomes more and more attenuated the gas is more and more unable to find its way through the gel.

"The gases of normal eyes in Emmental cheese are exclusively carbon dioxid and nitrogen, and of these only the carbon dioxid is of significance. The nitrogen accompanying the carbon dioxid in normal eyes is that of air originally occluded in the curd at the time of manufacture. There sometimes occurs during the initial fermentation an evolution of gas characterized by the presence of hydrogen. This is believed to be due to the gaseous fermentation of sugar. The hydrogen from such an initial fermentation may sometimes linger to contaminate the gas of normal eyes. The 2 fermentations are distinct and are characterized by their gaseous products. The one is detrimental, the other that demanded of a good Emmental cheese. High oxygen-absorbing power combined with low permeability of the cheese to air render the interior thoroughly anaerobic, and consequently favorable to the growth of anaerobic bacteria. A comparison between the amount of carbon dioxid evolved and the total volatile fatty acids shows that the activity of the propionic bacteria of von Freudenreich and Jensen (E. S. R., 18, p. 177) is not sufficient to account for all the carbon dioxid found. It was found that cheese is capable of retaining a very large amount of carbon dioxid. The possibility is suggested that there are two phases in the formation of normal eyes, a saturation of the body with carbon dioxid, and an inflation of eyes; and the bearing of this hypothesis on the production of gas by a specific cause is discussed."

The bacteriology of Cheddar cheese, E. G. HASTINGS, ALICE C. EVANS, and E. B. HART (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 150, pp. 52, pl. 1, figs. 4*).—This bulletin comprises, with slight changes, the text of Research Bulletin 25 of the Wisconsin Station, previously noted (E. S. R., 27, p. 879).

VETERINARY MEDICINE.

A text-book upon the pathogenic bacteria and protozoa for students of medicine and physicians, J. MCFARLAND (*Philadelphia and London, 1912, 7. ed., rev., pp. 878, pls. 3, figs. 283*).—A thoroughly revised edition of this work (E. S. R., 22, p. 182), with the addition of a section on pathogenic protozoa.

Tropical medicine and hygiene, C. W. DANIELS (*London, 1912, pt. 3, pp. VIII+250, pls. 2, figs. 13*).—This part of the work previously noted (E. S. R., 24, p. 479) deals with diseases due to bacteria and other vegetable parasites, to dietetic errors, and of unknown causation.

Veterinarian's handbook of materia medica and therapeutics, D. H. UDALL (*Ithaca, N. Y., 1912, pp. 177*).—This is a small pocket guide.

Report on the operations of the veterinary sanitary service of Paris and the Department of the Seine during the years 1910 and 1911, H. MARTEL (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine, 1910, pp. 239, figs. 17; 1911,*

pp. 240, figs. 17).—These are detailed reports of the work carried on during the years 1910 and 1911.

Report on the veterinary service of Saxony, 1911 (*Ber. Veterinärw. Königr. Sachsen, 56 (1911), pp. V+181*).—This is the annual report dealing with the occurrence of diseases during the year, meat inspection work, etc.

Annual report of the Punjab Veterinary College and of the civil veterinary department, Punjab, for the year 1911–12, H. T. PEASE and G. K. WALKER (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1911–12, pp. II+2+10+XII*).—This report includes accounts of the occurrence of contagious diseases during the year, breeding operations, etc.

Annual report on the civil veterinary department, Burma, for the year ended March 31, 1912, G. H. EVANS (*Ann. Rpt. Civ. Dept. Burma, 1912, pp. 2+15, pl. 1*).—This report includes accounts of the occurrence of contagious and other diseases, preventive inoculation, breeding operations, etc.

Anthrax of animals in Panama, with a note on its probable mode of transmission by buzzards, S. T. DARLING and L. B. BATES (*Amer. Vet. Rev., 42 (1912), No. 1, pp. 70–75*).—The authors here report the occurrence of this disease in a cow and a hog, but state that very few cases of anthrax in animals have been brought to their attention during the past 7 years. The infrequency with which anthrax has been encountered in Panama leads them to conclude that the territory from which cattle and hogs are obtained is almost entirely free from the disease. The fact that there is no importation of cattle into the Republic at the present time favors the relative immunity from the disease among herds near by.

In experiments conducted to determine the rôle of buzzards in the transmission of the infection, meat thoroughly soaked and mixed with a saline emulsion of anthrax bacilli and spores grown on agar plates was fed to 3 turkey buzzards. Numerous agar plates were immediately made of specimens taken at approximately 12, 36, 60, and 84 hours after feeding, but in none was the anthrax bacillus present. In order to introduce a maximum number of bacilli, the experiment was repeated by injecting a heavy saline emulsion of bacilli and spores into the gullet of the buzzard through a rubber catheter; agar plates were made as in the first experiment and anthrax bacilli found to be absent. The birds were killed shortly after the experiment was completed, and cultures taken from various portions of the intestinal tract showed the absence of anthrax bacilli.

The authors conclude from the investigations that pastures and other locations can not be infected by buzzards through the agency of droppings, but require more intimate contact.

Salvarsan in glanders, BLAGODETELEW (*Abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 35, p. 656*).—The author reports that the administration of 2.4 gm. of salvarsan to 3 horses suffering from glanders resulted in a generally improved condition in from 5 to 7 days. After 46, 47, and 54 days the ulcers on the nasal septum of 2 of the horses had healed, but the discharge had again increased and taken on a purulent character. The animals were then slaughtered, and glanderous foci were found in the lungs. The author is led to conclude that a partial destruction of the bacilli and a partial attenuation of their virulence was responsible for the apparent cure.

Researches on trichinosis, M. ROMANOVITCH (*Ann. Inst. Pasteur, 26 (1912), No. 5, pp. 351–370, pl. 1, figs. 2*).—This report of studies (E. S. R., 25, p. 587) made of the rat and guinea pig deals with the distribution of the larvæ in the infested organism, microbial infections in trichinosis, toxic action of the larva, and investigations of specific antibodies in the serum of infested animals.

It is stated that the course of the disease may sometimes be retarded by injections of tartar emetic. Salvarsan does not appear to exercise any action on the larvæ.

Antelope as a reservoir for Trypanosoma gambiense. H. L. DUKE (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 579, pp. 299–311*).—The author concludes "that the antelope may remain capable of infecting *Glossina palpalis* with *T. gambiense* for a period of at least 22 months after the original infection with this trypanosome; that there is some evidence to show that an antelope which has ceased to be infective for *T. gambiense* acquires some degree of immunity against reinfection."

Castor oil bean poisoning. T. PARKER (*Vet. Rec., 24 (1912), No. 1243, p. 690*).—Crushed castor oil beans in meal fed to swine caused the loss of several animals.

The action of anthelmintics on parasites located outside of the alimentary canal. B. H. RANSOM and M. C. HALL (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 153, pp. 23*).—The authors present a historical review of the literature relating to the action of anthelmintics on parasites, particularly those located outside of the alimentary canal. Experiments conducted are then briefly reported.

Tests of the action of carbon bisulphid, a proprietary remedy, and ethereal extract of male fern were made with a number of sheep. The results, while inconclusive, point to the inefficacy of carbon bisulphid, since in the one case where tapeworms (*Thysanosoma actinioides*) were found, they were alive after 12 gm. of carbon bisulphid had been administered. The proprietary remedy, which upon analysis was found to contain 49 per cent ferrous sulphate, 13 per cent arsenious oxid, 8 per cent oxids of calcium, potassium, silicon, and magnesium, and 29 per cent organic matter (the nature of which was not determined but did not contain santonin or any other vegetable alkaloid) appeared to be practically inert as a vermifuge and any improvement following its use must be attributable to the tonics contained in it. The extract of male fern, which was administered on 4 successive days to 4 sheep in doses of 6 cc. mixed with 25 cc. of linseed oil, was not efficacious against thysanosomiasis.

The authors find that the present state of our knowledge does not warrant any conclusion other than that a great amount of additional work is necessary and desirable. A bibliography is appended.

Experimental studies on the administration of salvarsan by mouth to animals and man. J. A. KOLMER and J. F. SCHAMBERG (*Jour. Expt. Med., 15 (1912), No. 5, pp. 498–509, pl. 1*).—"Salvarsan can be administered in pills, in capsules, and in solution to lower animals in dosage of 0.02 to 0.03 gm. per kilogram of body weight, without producing toxic symptoms. A dog received 0.57 gm. of salvarsan in pill and capsule form in the course of 29 days without any disturbing effects. After the oral administration of salvarsan, arsenic is found in the bile and urine at the end of 24 hours, but it disappears by the end of 72 hours. Twenty-four hours after the oral administration of salvarsan to rats, the number of bacteria in the intestinal tract appears to be reduced, the reduction being most striking in the lower end of the ileum.

"Salvarsan administered by mouth and likewise intravenously to rabbits in doses approximating those employed in human subjects does not produce, at least within 96 hours following its administration, any appreciable microscopic changes in the important viscera."

Note on a further experiment carried out to ascertain the effect of the ingestion of ergot by cattle. C. J. REAKES and H. A. REID (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 3, pp. 99–104, figs. 2*).—The results of a further experiment (E. S. R., 26, p. 586) on the toxic effect of ergot on cattle led the

authors to the following conclusions: That poisoning by ingestion of ergotized grass can and does take place; that the lesions following consist of dry gangrene of the extremities of the limbs; that when suppuration is present it is the result of germ infection by the *Bacillus necrophorus* aided by the presence of the casually occurring *Staphylococcus pyogenes;* that no definite inference should be drawn through failure to produce typical symptoms when utilizing official preparations of ergot, or old samples of it; that what may be termed a classic train of symptoms may not necessarily follow; and that a varying degree of insusceptibility to ergot poisoning is possessed by certain individual cattle.

The normal clinical urinalysis of the dairy cow, D. J. HEALY (*Amer. Vet. Rev., 42 (1912), No. 2, pp. 184–191*).—The author finds the urine of normal dairy cows to be approximately as follows: "Color, yellow; specific gravity, 1,014; reaction, alkaline; a slight flocculent precipitate, and occasionally a heavy white precipitate of calcium sulphate; urea, 1.06 per cent; hippuric acid, 1.17 per cent; ammonia, a trace; total nitrogen, 0.58 per cent; no albumin; no sugar. Microscopical examination: Squamous epithelial cells; irregular and spiral vegetable cells; starch granules; calcium sulphate crystals; and amorphous matter."

The samples used in the work were obtained, once during the 24 hours, from the registered Jersey cows which form the Kentucky Station dairy herd. With the exception of 4 samples, they were obtained during the period of evening milking, between the hours of 4 and 6 o'clock.

The ox warble, its evolution, injury, and means for combating it, A. MARTIN (*Rev. Vet. [Toulouse], 37 (1912), Nos. 8, pp. 457–469, pls. 2, fig. 1; 9, pp. 521–529*).—A summarized account.

On a nematode in the connective tissue of bovines, M. PIETTRE (*Hyg. Viande et Lait, 6 (1912), Nos. 9, pp. 473–488; 10, pp. 537–552, figs. 9*).—This is a more detailed report of the investigation previously noted from another source (E. S. R., 27, p. 83).

Some further researches on Johne's disease, F. W. TWORT and G. L. Y. INGRAM (*Vet. Jour., 68 (1912), No. 448, pp. 569–572*).—This is a continuation of the investigation previously noted (E. S. R., 26, p. 783).

A diagnostic reagent which is specific for Johne's disease has been prepared from a 9-months-old culture of Johne's bacillus grown on ordinary glycerin peptone beef broth containing glycerin saline extract of *Bacillus phlei.* This reagent when injected subcutaneously into an animal suffering from the disease causes a rise in temperature of from 4¼ to 5½° F., but has no effect on a healthy animal. "The disease being thus demonstrable to an owner in its earliest stages, on the use of such a vaccine as is here described becoming general, state legislation should be adopted, making slaughter compulsory. No compensation would be called for, the carcass of an affected animal being salable, and it being to the interest of the owner to remove a source of infection from his herd."

After repeated subculturing and after maintaining life about 18 months outside the animal body, the authors succeeded in inducing Johne's bacillus to grow on ordinary glycerin liver broth. Two young goats that were inoculated, one intravenously and one intraperitoneally, with living cultures of Johne's bacillus developed the disease. The authors consider it probable that the condition demonstrated in deer by McFadyean in 1907 and by Stockman in sheep in 1909 is caused by the same bacillus that affects bovines.

Further notes on Johne's disease in cattle, J. T. ANGWIN (*Vet. Rec., 24 (1912), No. 1247, pp. 754–758, pl. 1*).—A summarized account with reports of several cases.

Johne's disease, J. M'FADYEAN, A. L. SHEATHER, and J. T. EDWARDS (*Jour. Compar. Path. and Ther., 25 (1912), No. 3, pp. 217–275, pl. 1, figs. 35*).—The authors first present records of examinations of 19 natural cases of Johne's disease. The cultural characters of the bacilli are then dealt with, followed by an account of the morphology and staining characteristics of the organism.

Do different species of Piroplasma occur in cattle in Germany? P. KNUTH (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 17, pp. 295–298, figs. 3*).—This is a discussion of the occurrence of 2 species of Piroplasma (*bigeminum, divergens*) in cattle in England, the probable occurrence of both in cattle in Germany, and the rôle of *Ixodes ricinus* and *Hæmaphysalis punctata* in their transmission.

The treatment of rinderpest and hemorrhagic septicemia with permanganate of potash, G. K. WALKER (*Jour. Compar. Path. and Ther., 25 (1912), No. 3, pp. 185–202*).—Thirty animals suffering from rinderpest were given permanganate of potash by mouth in doses varying from ½ to 2 dr. dissolved in from 3 to 5 pt. of cold water to which 1 or 2 oz. of vinegar had been added. Several 1 or 2 dr. doses were also administered later on. Three of the cases treated and 7 of the 13 controls died.

Permanganate of potash, ½ to 3 dr., was also administered to 23 cases of hemorrhagic septicemia, of which 10 recovered. Of the cattle 83.3 per cent recovered, while of the buffaloes, which are more susceptible to this disease, but 29.4 per cent recovered.

Interim report re the dosing of sheep with Cooper's dip and bluestone under the conditions of a sour veld farm, A. THEILER (*Agr. Jour. Union So. Africa, 4 (1912), No. 2, pp. 161–171*).—The author has repeated the experiments relating to the dosing of sheep, previously noted (E. S. R., 27, p. 683), with a view to determining the maximum dose for sheep and lambs. The results have been summarized as follows:

"The maximal safe dose for sheep of 4 to 8 tooth under the conditions of the sour veld in Stutterheim District was found to be 15 grains of Cooper's dip and 15 grains of bluestone. The maximal safe dose for sheep of 2-tooth under the same conditions proved to be 10 grains of Cooper's dip and 10 grains of bluestone. The maximal safe dose for lambs between 5 and 9 months old under the same conditions proved to be 7½ grains of each. Smaller doses than the maximal ones proved to be equally effective on the wireworms as the maximal safe dose. (This, however, requires further investigation on a much larger number of sheep and lambs.) The mixture of Cooper's dip and bluestone, even in the maximal doses, does not expel all worms, although it reduces their number."

Hog cholera—Demonstration of a filterable virus as the cause of the disease in Portugal, A. BETTENCOURT (*Bul. Soc. Portugaise Sci. Nat., 5 (1911), No. 2, pp. 50–53*).—This paper reports the preliminary results of the work of the commission appointed to study swine diseases in Portugal.

Directions for vaccinating against hog cholera, F. B. HADLEY (*Wisconsin Sta. Circ. Inform. 39, pp. 11, figs. 6*).—This circular discusses the symptoms of hog cholera, manner of preparing the antiserum, and details relating to vaccination.

Navel-ill in new born foals, W. J. TAYLOR (*Montana Sta. Circ. 11, pp. 39–41*).—A brief popular account of this disease.

Death of mules due to parasites, H. BRADLEY (*Amer. Vet. Rev., 42 (1912), No. 2, pp. 217, 218*).—This is a report of cases in which death was caused by the parasites *Sclerostomum tetracanthum* and *S. equinum*, or *Strongylus armatus*, the first mentioned being present in much greater numbers. These parasites were numerous in the cecum and colon, but none could be found in the blood vessels.

Report on an outbreak of canine piroplasmosis due to Piroplasma gibsoni among the hounds of the Madras Hunt, together with some observations on the treatment of the disease with salvarsan, T. H. SYMONS and W. S. PATTON (*Ann. Trop. Med. and Par., 6 (1912), No. 3, pp. 361–370, figs. 6*).—Rapid recovery followed the administration intramuscularly of 0.6 gm. of salvarsan to hounds suffering from piroplasmosis due to *P. gibsoni*. This disease appears to be transmitted from the jackal (*Canis aureus*) to hounds by an undescribed species of Rhipicephalus.

A species of Trichosomum in the turkey (Meleagris gallopavo domestica), C. BARILE (*Bul. Soc. Zool. France, 37 (1912), No. 4, pp. 126–133, figs. 3*).—The name *Trichosomum meleagris gallopavo* is given to a new species of nematode which caused fatal lesions in the intestine of a turkey at Turin, Italy.

RURAL ENGINEERING.

Seepage and return waters, L. G. CARPENTER (*Colorado Sta. Bul. 180, pt. 2, pp. 3–47*).—This portion of this bulletin contains tables giving detailed seepage measurements, showing the absolute amount of seepage gain from year to year in the Cache la Poudre River for a period of some 25 years, and also the progressive changes due to the development of irrigation during this period. The measurements made up to 1896 have been previously noted (E. S. R., 7, p. 898). It is announced that comments and conclusions from the measurements are to be given in part 1 of this bulletin, which has not yet been issued.

The conveyance of irrigation water: Practice in British Columbia (*Engin. and Contract., 38 (1912), Nos. 10, pp. 274, 275; 11, pp. 306–308, figs. 3; 12, pp. 328–331*).—This article deals with seepage losses in canals, canal linings to prevent seepage losses, steel flumes, and plain and reinforced concrete pipe. It is stated that wooden flumes are more economical in the long run than wooden pipe systems; that concrete lining for canals is on the whole more satisfactory in preventing seepage losses than oil, clay-puddle, thin cement mortar, or wood; and that concrete pipe is more durable and economical than wood or iron pipe up to a pressure head of about 150 ft.

Why irrigating water should be measured, R. R. LYMAN (*Engin. News, 68 (1912), No. 16, pp. 722, 723*).—The author states that on every irrigated farm records should be kept of the amount of water used, the time of application, and the crop results, thus showing the amount which makes a good crop, and the surplus which waterlogs and ruins the land. He further points out the importance of having an expert irrigation engineer in charge of the measurement and distribution of irrigation water to prevent waste of water and waterlogging.

The use of small pumping plants for irrigation in British Columbia (*Engin. and Contract., 38 (1912), No. 14, pp. 389–392*).—This article deals in a comprehensive manner with the selection, installation, efficiency, and cost of small pumping plants as applied to irrigation in British Columbia.

The required capacity of the plant depends on the area irrigated, the water duty, and the period of operation. It has been found desirable to operate the pumping plant only one-third to one-half of the time during the irrigation season, since continuous operation means loss of time, poorly distributed water, uneconomical irrigation, and loss of efficiency in the plant. This requires a plant 2 or 3 times the size of that required for continuous irrigation, and for the smallest orchard a stream of at least 63 gal. per minute is desirable.

In a comparison of centrifugal pumps and power plunger pumps it is stated that plunger pumps are best adapted to high heads above 75 ft. and small

or moderate volumes of water under 200 gal. per minute; while centrifugal pumps are best adapted to lifts below 75 ft. and high volumes above 200 gal. per minute. Efficiencies of from 30 to 55 per cent are given for entire centrifugal pumping plants, varying with the type of pump, connection with power, and the speed; and efficiencies of from 30 to 78 per cent are given for plunger pumps alone, varying uniformly with the size of the pump and the lift. The power required to operate pumps is computed on the basis that 1 horsepower is equivalent to 3,960 gal. per minute raised 1 ft. As economical limits for pumping it is stated that for small plants it is not well to exceed lifts of 200 ft., while for large plants lifts of 400 ft. may be economical.

[An irrigation pumping plant with three lifts], G. T. INGERSOLL (*Engin. and Contract., 38 (1912), No. 14, pp. 385–389, figs. 5*).—This presents the details of an electrically driven pumping plant for irrigation, equipped with 8 centrifugal pumps operating in 3 groups under 3 different lifts of 50, 83, and 108 ft. and delivering 34,400 gal. per minute.

The cost and methods of clearing land in western Washington, H. THOMPSON (*Washington Sta. Bul. 8, spec. ser., pp. 3–34*).—The material contained in this bulletin has been previously noted as Bulletin 239 of the Bureau of Plant Industry of this Department (E. S. R., 27, p. 189).

A text-book on roads and pavements, F. P. SPALDING (*New York and London, 1912, 4. ed., rev. and enl., pp. XI+408, figs. 51*).—This book gives a brief discussion from an engineering standpoint of the principles involved in highway work and outlines the more important systems of construction, giving considerable space to the location and construction of country roads for the special benefit of the rural engineer. It contains chapters on road economics and management; street and road drainage; location, improvement, and maintenance of country roads; broken-stone and bituminous macadam roads; foundations for pavements; brick, asphalt, wood-block, stone-block, and concrete pavements; and city streets.

Farm gas engines, H. R. BRATE (*Cincinnati, 1912, pp. 195, figs. 36*).—This book describes in a comprehensive and general way the actions of the parts necessary to the successful running of a gas engine, giving examples of various troubles found in its operation, with remedies, and paying special attention to the subjects of carburetion, ignition, compression, cooling, and lubrication. In addition it contains chapters on the 2 and 4 cycle types, fuels, gas tractors and portable outfits, pumping plants, electric-lighting plants, farm machinery operated by gas engines, and marine engines.

[Motor plow and cultivator] (*Impl. and Mach. Rev., 38 (1912), No. 450, pp. 791, 792, figs. 3*).—Descriptions are given of a small motor plow and motor cultivator, both of which are intended for use where space is limited, as around fruit trees and in small market gardens.

The plow has a wrought-iron framework and road wheels 2 ft. in diameter, with 7 in. rims, driven by a 4-horsepower water-cooled gasoline engine. The transmission is obtained through a chain to a shaft with a friction clutch controlled from the plow handles, thence by iron spur gearing to the road wheels. The whole weighs 650 lbs. It is claimed that 1 acre of land can be turned with 3½ gal. of gasoline.

The cultivator is driven by a 2-horsepower fan-cooled engine and the framework is arranged to accommodate any standard cultivator tool. This machine is also fitted to carry and operate a spraying machine. In both machines the speed may be adjusted to suit the operator and the reaction of the engine tends to keep the tools to their correct depth in the ground.

Tractive resistance of plows, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 24 (1912), No. 36, pp. 303–305*).—The author discusses the tractive resistance of plows in various soils, and shows that it varies with the construction, weight, and stability of the plowing machine, the speed of the operation, and the nature and condition of the soil.

[Adjusting the seed drill], H. B. BONEBRIGHT (*Montana Sta. Circ. 15, pp. 100–102, fig. 1*).—To adjust a drill to sow a given amount of seed per acre the following procedure may be used: Divide the number of square feet in an acre by the effective width of the drill in feet, and divide this result by the circumference of the drive wheel, thus obtaining the number of revolutions which the wheel will make in sowing an acre. Jack up one end of the drill, and after filling the box with the grain which is to be sown turn the wheel enough times to sow ½ or ¼ acre. Catch this grain on a canvas and weigh. Readjust the drill and repeat until the correct amount of grain is let down.

Oil-mixed Portland cement concrete, L. W. PAGE (*U. S. Dept. Agr., Office Pub. Roads Bul. 46, pp. 28, pls. 5, figs. 7*).—This bulletin describes a simple method devised by the author for damp-proofing concrete by the incorporation of mineral oil residiuum with the ordinary concrete mixture, gives the results of physical tests, and describes the application of oil-mixed Portland cement concrete to such structures as basement floors, cellar walls, watering troughs and tanks, cisterns, barns, building blocks, roofs, and other engineering constructions.

Where damp-proofing is required 5 per cent of petroleum residuum oil, based on the weight of cement in the mixture, is all that is necessary. In hand mixing, the sand, cement, and water are first mixed to a mushy consistency, the oil then added and mixed until no trace of it is visible on the mortar surface, and the stone or gravel then mixed in. In machine mixing, the sand, cement, and water are first mixed to a mortar, when alternate batches of oil and stone are added and mixed.

The following conclusions are drawn from the results of physical tests of oil-mixed Portland cement concretes: "(1) The tensile strength of 1:3 oil-mixed mortar is very little different from that of plain mortar, and shows a substantial gain in strength at 28 days and 6 months over that at 7 days. (2) The times of initial and final set are delayed by the addition of oil; 5 per cent of oil increases the time of initial set by 50 per cent and the time of final set by 47 per cent. (3) The crushing strength of mortar and concrete is decreased by the addition of oil to the mix. Concrete with 10 per cent of oil has 75 per cent of the strength of plain concrete at 28 days. At the age of 1 year the crushing strength of 1:3 mortar suffers but little with the addition of oil in amounts up to 10 per cent. (4) The toughness or resistance to impact is but slightly affected by the addition of oil in amounts up to about 10 per cent. (5) The stiffness of oil-mixed concrete appears to be but little different from that of plain concrete. (6) Elasticity.—Results of tests for permanent deformation indicate that no definite law is followed by oil-mixed concrete. (7) Absorption.—Oil-mixed mortar and concrete containing 10 per cent of oil have very little absorption and under low pressures both are waterproof. (8) Permeability.—Oil-mixed mortar containing 10 per cent of oil is absolutely water-tight under pressures as high as 40 lbs. per square inch. Tests indicate that oil-mixed mortar is effective as a waterproofing agent under low pressures when plastered on either side of porous concrete. (9) The bond tests show the inadvisability of using plain bar reenforcement with oil-concrete mixtures. The bond of deformed bars is not seriously weakened by the addition of oil in amounts up to 10 per cent."

The action of alkali on hydraulic cements, E. BURKE and R. M. PINCKNEY (*Montana Sta. Circ. 8, pp. 35–49, figs. 3*).—This circular is a popular edition of Bulletin 81, previously noted (E. S. R., 25, p. 490), but containing data on additional waterproofers for cement.

The economical design of reinforced concrete beams, R. B. KETCHUM (*Utah Engin. Expt. Sta. Bul. 4, 1912, pp. 78, figs. 9*).—This bulletin gives a mathematical discussion of the design of reenforced concrete beams and slabs, with tables and diagrams intended to simplify the application of the accepted theories on the subject.

Types of stables, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 24 (1912), No. 38, pp. 369–372, figs. 5*).—The author describes different arrangements and dimensions of stalls and mangers to suit average-sized animals and to facilitate the work of feeding and stable cleaning, and discusses the barn-frame construction from the standpoint of general sanitation for the animals and economy of space and material.

Cow sheds (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 2, pp. 145–147, figs. 4*).—Detailed working plans for open-front cow sheds, giving the quantities of timber, roofing, iron, and concrete necessary, are presented.

Poultry houses, W. F. SCHOPPE (*Montana Sta. Circ. 9, pp. 15, figs. 6*).—This publication gives notes on the location of poultry houses, so that drainage, sunlight, and protection from the weather may be obtained, and on ventilation and general sanitation, and describes and outlines the details of construction of the curtain-front poultry house, previously noted (E. S. R., 21, p. 274).

Sewage disposal for rural homes, C. A. OCOCK and W. H. WRIGHT (*Wisconsin Sta. Circ. Inform. 34, pp. 15, figs. 10*).—This publication discusses the theory of sewage purification by bacterial action and outlines a system of sewage purification and disposal, consisting essentially of purification, sedimentation, and liquefaction in a septic tank, and final purification and disposal by means of distribution through an absorption system of open-jointed drain tile set in sandy or porous soil.

The design, construction, and operation of single and double chamber septic tanks and their corresponding absorption systems are outlined, the single tank discharging by means of a hand-operated valve plug and the double tank by an automatic siphon. Since the single tank destroys its film or scum at every discharge it should be used only for small families and should have one-fourth to one-third more absorbing tile. The tanks should be of sufficient capacity to hold from 1 to 3 days' sewage and from 1 to 2 ft. of tile should be provided for every gallon of sewage discharged, according to the porosity of the soil. A grease trap to separate the grease and sewage from the kitchen and dairy room is described, consisting of 2 large glazed sewer tile with the outlet to the septic tank so arranged as to prevent the escape of the grease. The total cost of a single tank and absorption system under average conditions is given as $62.05, and of a double tank system $69.00.

The use of a septic tank in farm sewage disposal, W. C. DAVIDSON (*Hoard's Dairyman, 44 (1912), No. 12, pp. 331, 332, figs. 3*).—This article outlines the design, location, and construction of a farm sewage disposal system of sufficient size to meet average conditions. It is estimated that the septic tank should have an average capacity of 50 gal. per capita per day, which means that the siphon chamber should discharge every 24 hours with the required capacity, and the settling chamber be of about twice this capacity for good bacterial action. For disposal after discharge the method is suggested of distributing the sewage through a system of open-jointed drain tile laid in sandy or porous soil, allowing about 75 ft. of 3 in. or 4 in. drain tile for every 50 gal. of sewage discharged.

RURAL ECONOMICS.

Supply of farm labor, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 94, pp. 81*).—This bulletin presents the results of an examination of the farm labor situation in the United States in respect to the supply of such labor, together with a comprehensive treatment of the various phases of the subject as related to the number of persons in agricultural occupations, agricultural laborers, farm wages, price of farm products, etc.

It is reported that of all persons 10 years old and over employed in gainful occupations, 83.1 per cent were employed in agriculture in 1820; 77.5 per cent in 1840; 47.3 per cent in 1870; 44.1 per cent in 1880; 37.2 per cent in 1890; and 35.3 per cent in 1900. The absolute number of persons, however, has increased from 2,068,958 in 1820 to 10,249,651 in 1910.

In 1910 the Division of Information of the Bureau of Immigration found employment for 2,761 persons in agriculture, this being 64 per cent of all persons for whom employment was found. The New York farm employment office the same year succeeded in placing with farmers 4,576 single farm hands and 122 families.

The average value of implements and machinery per farm as reported was $101 in 1880, $108 in 1890, $131 in 1900, and $199 in 1910. The average value per farm worker was $122 in 1880, $165 in 1890, and $170 in 1900.

The results of a special inquiry indicate that 42.7 per cent of the male farm laborers of the United States are competent to become farm tenants, and that it is reasonably possible for such laborers or farm tenants to acquire farms large enough to support themselves and families.

Other data are given showing the relative importance in the various geographic divisions, as regards the number of agricultural laborers, of sex, color, and place of birth; agricultural colonies; effect of near-by cities on farm wage rates; relation of wages to the product; comparison of average wage rates of outdoor labor of men on farms, with industrial, urban, and productive conditions; movement of prices of farm products; productivity of labor and relative importance of farms of specified acreages; percentage of farms classified according to the total of improved and unimproved acreage; and ratio of agricultural workers to improve area of farms, 1880–1900; hand and machine labor contrasted; intensive agriculture as a source of wages; and quality of labor required.

As regards the future supply of farm labor, the author points out that "the farmer would not need to get his labor from the cities if he could hold the country population to the soil," and emphasizes the efforts now being made to secure the retention of children upon the farm.

Wages of farm labor, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 99, pp. 72, fig. 1*).—This bulletin presents the results of the investigations in 1909 of the wage rates of farm labor in the United States, showing by notes and tables the wage rate paid to men and women on farms by the day, month, and year in various States, geographic divisions, and for the United States as a whole at stated periods of time, and discusses extras received by laborers, the purchasing power of money wages, the influence of near-by cities on farm labor, wages, etc., and domestic labor of women on farms, alleged high insanity of farm women, etc.

The summary of average wage rates for the United States shows that the wages paid in 1909 for outdoor labor of men on farms, with board, were higher than in any of the other years covered by the series of investigations. "In 1909 monthly wages paid in hiring by the year exceeded the average for 1866 by 78.9

per cent and the average for 1890 by 35.8 per cent, while in contracts by the season monthly wages in 1909 were 63.9 above those of 1866. The combined averages for yearly and seasonal contracts in 1909 exceeded those of 1892 by 48.4 per cent and showed a gain of 44 per cent over 1899. The daily wages of harvest hands in 1909 exceeded the averages for 1866, 1890, and 1899 by 37.5, 32.4, and 30 per cent, respectively, while the corresponding increases of daily wages paid to farm hands for other work than harvesting were, respectively, 60.9, 43.1, and 37.3 per cent. For every dollar earned, on an average, by a farm laborer in 1866, under contracts which included board, from $1.30 to $1.79 was earned in 1909."

Cost of agricultural labor, E. GÓMEZ GARZA (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 36, 1912, pp. 85*).—This bulletin presents the results of a special inquiry as to the cost of agricultural labor in Mexico, together with a discussion of the factors entering into the cost of agricultural production, giving special attention to capital, labor, land, transportation, use of machinery, social conditions, and the farmer as an individual. The inefficiency of Mexican labor as compared with American labor is said to be due to the fact that the former is not as well fed nor as well educated, with fewer wants to satisfy and consequently less incentive to work.

What cooperation has done for tobacco growers, J. W. GRIFFIN (*Farmers' Rev., 44 (1912), No. 27, p. 634, figs. 2*).—This article points out some peculiar advantages of agricultural cooperation to the tobacco grower, by showing what has been accomplished by the Burley Tobacco Society of Kentucky, organized for the purpose of receiving, handling, warehousing, inspecting, grading, financing, and selling all tobaccos grown by the members of the society. It is noted that farmers' loose leaf sales houses have been built in the principal towns and cities of the burley tobacco districts, where farmers carry their tobacco and dispose of it directly to buyers who use the various grades. The sales of the entire season in some of the markets are reported to have averaged more than $10 per 100 lbs. while "before the organization of this society the same tobaccos would not have averaged more than $3.50 or $4 per 100 lbs."

Democracy by means of economic science, R. B. BRINSMADE (*Bol. Dir. Gen. Agr. [Mexico], Rev. Econ. Rural y Soc., 1 (1911), No. 8, pp. 681–698*).—The author here discusses in a general way the relation existing between democracy and the production and distribution of wealth as related to agriculture, with special application to conditions in Mexico. He maintains that the ideal democracy in economics is the equality of opportunity in production and equitable distribution, noting that equal and equitable distribution are separate and distinct principles. Among a number of related subjects dealt with in connection with the discussion as they relate to agriculture may be noted the single-tax theory, particular monopolies, the relation and economic effect of small and large farms, systems of land purchase, value and significance of different classes of land, tax on land grants and other landed property, increase in agricultural production, high cost of living, agricultural wages, effect of tariffs on agriculture, agricultural education, immigration, etc.

Economic science and statistics, H. H. CUNYNGHAME (*Nature [London], 90 (1912), No. 2239, pp. 116–118, figs. 8*).—An address before the British Association at Dundee, in which the author presents a number of illustrations to show that economics is a distinct and well-defined science capable of being demonstrated by means of geometry and mathematics. He gives diagrams which show by the use of curves a sympathetic relation between the price of wheat, coal, etc., the average of money wages, and the number of marriages per head of population; how the absolute cost of growing corn increases in proportion

to the quantity produced; the total cost of growing corn; the surplus profit obtained from the use of better land; and the total benefit the consumer derives from the corn expressed in terms of money.

Systems of cultivation and their relation to rural economics in Spain, G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ., 4 (1912), Nos. 41, pp. 470–481; 42, pp. 532–543; 43, pp. 630–641; 44, pp. 726–737; 45, pp. 828–839*).—This is a continued article discussing in detail economic significance of systems of agriculture as practiced in Spain; crop diversification and the advantages attending the conservation and protection of forests; the main causes for the increase of uncultivated lands; the relation between cereal and pastoral lands and the proportion they bear to the various systems of agriculture; and systems of cultivation, giving special attention to a number of leading crops; together with some observations relative to irrigation and fertilization as factors in intensive agriculture.

Sugar at a glance, T. G. PALMER (*U. S. Senate, 62. Cong., 2. Sess., Doc. 890, 1912, pp. 68, figs. 56*).—This document discusses the growth of the beet-sugar industry in the United States and foreign countries, with the idea of showing how national economy and the cost of living are affected to an extent by the increased yield of other crops when grown in rotation with sugar beets. A number of charts are given illustrating the effect of import duties upon the development and progress of the industry.

[Farm product statistics] (*Bur. of the Census [U. S.] Bul. 13, pp. 35–39*).—Data regarding the quantity and value of materials, products, etc., of a number of important industries manufacturing farm produce in the United States are here presented.

The total cost of materials, viz, milk, cream, sugar, etc., in the butter, cheese, and condensed-milk industry is reported at $108,841,200 in 1899 as compared with $235,546,064 in 1909, while the total value of the products was $130,783,349 in 1899 and $274,557,718 in 1909. The increase in price of the factory products has also been quite pronounced, as shown by the fact that the butter product increased 113.5 per cent in value and only 48.7 per cent in quantity; and the output of cheese 63 per cent in value and only 10.3 per cent in quantity.

The total quantity of all kinds of grain milled in 1909 as reported was 806,247,961 bu., or 10.6 per cent more than in 1899; the increase in the value of all products of flour mills and grist mills for the same period being 76.2 per cent. The value of wheat flour produced increased 64.7 per cent, but its quantity only 6 per cent; while the production of rye flour increased 54 per cent in value and only 6.2 per cent in quantity. The increase in quantity of pork as reported by the slaughtering and meat-packing industry was 16,421,398 lbs., or less than 1 per cent, while the value of the product increased $166,376,042, or 51.9 per cent. The quantity of lard increased 223,785,765 lbs., or 21.9 per cent, while its value increased $73,256,353, or 119.8 per cent.

Corresponding data are given for a number of other farm products.

Imports of farm and forest products, 1909–1911, by countries from which consigned (*U. S. Dept. Agr., Bur. Statis. Bul. 95, pp. 83*).—This report is a continuation of a series of bulletins showing for stated periods the quantity, value, etc., of imports of farm and forest products into the United States by grand divisions and countries from which consigned (E. S. R., 26, p. 294).

The value of farm products imported into the United States during the year ended June 30, 1911, amounted to $680,204,932, as compared with $687,509,115 the previous year, and these imports formed 44.5 per cent of all imports. The value of imports of forest products in 1911 amounted to $162,311,565, as compared with $178,871,797 in 1910, the decrease being largely in india rubber.

Exports of farm and forest products, 1909–1911, by countries to which consigned (*U. S. Dept. Agr., Bur. Statis. Bul. 96, pp. 100*).—This is a continuation of a series of bulletins (E. S. R., 26, p. 294), presenting a compilation of statistics as to the exports of farm and forest products of the United States for the year ended June 30, 1911.

The total value of domestic farm products exported in 1911 is placed at $1,030,794,402. or nearly $160,000,000 more than last year, and of forest products at $103,038,892, as compared with $85,030,230 in 1910. The balance of trade in them was $365,254,018 in favor of the United States in 1911, as compared with $198,118,937 in 1910 and $274,210,152 in 1909. About 40 per cent of the consignments of domestic farm products was sent to the United Kingdom; 20 per cent to Germany; and the remaining 40 per cent to 89 different countries.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 10, pp. 73–80, figs. 3*).—Notes and statistics are given showing the condition of the cotton crop, September 25, 1912, to be 69.6 per cent as compared with 71.1 per cent at the same time last year. Other data are given showing the condition of other crops October 1, 1912, with comparisons; production of wheat in specified countries, 1912–1910; sugar production of Porto Rico, 1908–1911; apparent balance of trade of the United States for the year ended June 30, 1912; farm value of important products on dates indicated; a report on cotton ginning; data as to the estimated production of wheat in the Northern Hemisphere, of rye in 15 countries, of barley in 19 countries, of oats in 19 countries, and of corn in 10 countries; the farm value of important crops and products; together with tables showing exports of farm and forest products; Philippine sugar; cotton consumption and supply; monthly receipts and stocks of butter and eggs; and range of prices of agricultural products at important markets.

AGRICULTURAL EDUCATION.

Relation of agricultural college to other institutions (*Farmer's Advocate, 47 (1912), Nos. 1032, pp. 962, 963, 980, figs. 3; 1033, pp. 1028, 1029*).—This is a symposium by presidents, directors, and deans of agricultural colleges and directors of experiment stations in Canada and this country on the ideal relationship between the agricultural college and institutions at which other branches of learning receive attention.

Theoretical-practical school of agriculture [in Brazil] (*Rev. Vet. e Zootech., 2 (1912), No. 2, pp. 120–135, pls. 4*).—This is an account of the object, equipment, and curriculum of the school of agriculture recently established in connection with the zootechnical station at Pinheiro.

Agricultural education, G. C. Creelman (*Ann. Rpt. N. J. Bd. Agr., 38 (1910), pp. 116–120*).—The reason why professional men and tradesmen do not return to a rural community to live out the balance of their days is briefly discussed. The Ontario plan for improving agricultural instruction in rural schools, whereby a large number of the rural school-teachers in attendance at the normal schools attend the Ontario Agricultural College for 10 or 12 weeks each year, is outlined and commended.

Debatable issues in vocational education, D. Snedden (*Vocational Ed., 2 (1912), No. 1, pp. 1–12*).—The sphere and necessities of vocational education are defined and a few of its problems discussed. It is stated that "the final test of vocational education is the degree to which it is able to connect itself with right standards of efficiency in the economic world."

Education for the open country, O. J. Kern (*Ann. Rpt. Missouri Bd. Agr., 44 (1911), pp. 461–471, figs. 5*).—An illustrated address dealing largely with the improvement of the physical conditions of the country school.

School gardens as an educational factor, J. Boddy (*Ann. Rpt. Columbus Hort. Soc., 1910, pp. 27–33*).—A brief review of the school garden movement in Europe and America, with particular reference to this work in Cleveland, Ohio.

[School and home gardening] (*R. I. State Col. and Bd. Agr. Ext. Bul., 1 (1911), Nos. 1, pp. 9, figs. 2; 2, pp. 13, fig. 1; 3, pp. 32, figs. 13; 4, pp. 100, pls. 19, figs. 4; Ann. Rpt. Bd. Agr. R. I., Dept. School and Home Gardens, 26 (1910)*).—These bulletins contain information concerning children's exhibits, corn growing contests, and school and home garden work done in Providence and other parts of the State from 1905 to 1910, inclusive, in cooperation with the extension department of the Rhode Island State College, the league of improvement societies in Rhode Island, and other organizations.

Biological training for agricultural students, G. H. Carpenter (*Jour. Econ. Biol., 7 (1912), No. 2, pp. 37–40*).—In this paper, which was read before the Association of Economic Biologists, in Dublin, March 28, 1912, the author gives a brief account of the courses in biology given in the Royal College of Science for associateship in the faculty of agriculture. The course for the associateship diploma has recently been extended to 4 years. Practical farm work is not taught in this college but a knowledge of farm practice is a rigid entrance requirement.

Economic biology for high school, A. E. Shirling (*School Sci. and Math., 12 (1912), No. 6, pp. 473–475*).—This outlines a course in economic biology that has been tried out somewhat experimentally in a city high school. Although the tendency had been to neglect pure science work, the familiar, practical treatment given to subjects like forestry, soils, insects, weeds, etc., as they might relate to city conditions, "seemed to make the study seem worth while to the pupils."

The New York high-school course in farm mechanics and drawing, F. W. Howe (*Cornell Countryman, 9 (1912), No. 9, pp. 285–287*).—The author claims that the high-school course in farm mechanics aims not so much at personal skill of hand as at the understanding and application of mechanical principles in farm work, and that its products are designed to be put to the test of practical use.

General review of the present status of instruction in agricultural economics, Aereboe (*Arb. Deut. Landw. Gesell., 1910, No. 167, pp. 1–12*).—Attention is called to the reasons why instruction in rural economics, taxation, and bookkeeping has not kept pace with the technical subjects of plant and animal production; to the efforts made in the past 10 years in promoting instruction therein by various German organizations; and to the available literature for instruction in these subjects. In the author's opinion there should be a sharp distinction between the problem of the promotion of agriculture in general and the problem as to how the individual farmer, independent of others, can increase the profits of his farm. A discussion of these problems follows.

Recent progress in agricultural economics (*Arb. Deut. Landw. Gesell., 1910, No. 167, pp. XI+460+4*).—This number comprises 19 lectures delivered at the seventh course of instruction for itinerant instructors offered by the German Agricultural Society at Eisenach from March 31 to April 6, 1910, on various phases of the subject.

Teaching language through agriculture and domestic science, M. A. Leiper (*U. S. Bur. Ed. Bul., 1912, No. 18, pp. 30*).—This bulletin is intended as a practical aid to teachers in the elementary and grammar grades, and especially those in rural schools. There are, in addition to practical suggestions as to the choice of subject-matter for oral and written composition work in the rural school, books relating to agriculture, home economics, and nature study

classified with respect to their adaptability for the various grades. Outlines are also presented, grade by grade, that the rural teacher may have, in the correlation of practical rural-life subjects with language work, a source from which he may draw or to which he may add such topics as may appeal to his pupils and suit local conditions.

Vocational schools and itinerant instruction in the promotion of cattle breeding and utilization, V. SCHUMY (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 221–228*).—In this article the author suggests how the agricultural school and itinerant instruction may be utilized by adding farm management and agricultural commerce to the curriculum of the agricultural school. This would give more attention to theoretical instruction in breeding, feed production, and feeding, and special importance to practicums in these subjects, short courses, and the assistance of the itinerant instructor in giving advice to individuals and existing organizations for the promotion of cattle breeding and utilization.

Wisconsin bankers' agricultural contests, R. A. MOORE and K. L. HATCH (*Wisconsin Sta. Circ. Inform. 38, pp. 9, figs. 8*).—The object of these contests as stated is to secure a wider dissemination of pure-bred, high-yielding grains adapted to Wisconsin conditions and to encourage improvement in general agricultural practice.

"The first step in this direction is the arrangement for a grain show, to which farmers are invited to bring the best corn and other grains they are now producing and offer them in competition for prizes. At this first meeting, pure-bred seed furnished by the college is distributed by the bankers to all farmers making exhibits. The seed thus distributed is grown by the farmers, and exhibits of the product shown at the bankers' contest the following fall. At the second show there are classes for both the common and the pure-bred varieties of grain. This gives opportunity for definite comparison between the common and pure-bred varieties both in the exhibit and in the field."

The circular presents information as to how to secure and conduct a grain contest, and cites some results of former contests. It is stated that in 1911 over 3,000 samples of pure-bred seed were distributed among farmers and 3,127 exhibits made, with a total attendance estimated at 6,475. Reports from 59 farmers near Mosinee showed a large average increase in the yield of corn produced and the number of hogs owned.

Railroads and farming, F. ANDREWS (*U. S. Dept. Agr., Bur. Statis. Bul. 100, pp. 47, figs. 2*).—This bulletin represents a report on the increasing efforts made by railroad companies of the United States to augment the number of farmers along their lines and to improve agricultural methods.

The total mileage operated by railroads making organized efforts to promote agriculture is estimated at 191,448 miles, or 76.6 per cent of the total mileage, and representing a total farm area in the counties traversed of 810,722,451 acres.

Data are given as to the efforts and methods used by railroads to induce homeseekers to settle along their lines, also to promote agricultural education in cooperation with federal and state experts, instruction trains, railroad farms, demonstration plats, prizes for farm products, agricultural associations, and through improving marketing facilities, supplying farm laborers, increasing the area of farm land, disseminating literature, and encouraging forestry and ornamental gardening.

NOTES.

California University and Station.—H. E. Van Norman, dairy husbandman of the Pennsylvania College and Station, has been appointed dean of the University Farm School at Davis and vice director of the station.

Georgia College.—George A. Crabb has been appointed adjunct professor of agronomy, vice J. E. Turlington, whose resignation has been previously noted, and enters upon his duties March 15.

Illinois University and Station.—Ralph Rodney Root, of Harvard University, has been appointed instructor in landscape gardening.

Purdue University and Station.—J. E. Dougherty has resigned as assistant in poultry husbandry in the university to accept the position of assistant professor of dairy industry and assistant in dairy industry in the California University and Station, with headquarters at Davis, and has been succeeded by Harry Embleton. C. M. Vestal has been appointed assistant in animal husbandry in the Kansas College and Station. Ivan McKellips has been appointed assistant in dairying.

Louisiana Stations.—S. G. Chiquelin and S. E. McClendon, assistant directors respectively of the Sugar Station at Audubon Park and the North Louisiana Station at Calhoun, have resigned, and have been succeeded by W. G. Taggart and J. B. Garrett. I. Selecter has been appointed assistant chemist in the fertilizer and feed stuffs laboratory.

Massachusetts College and Station.—The annual report of the president recommends the appointment of a state commission on agricultural education and organization, to study and report upon the question of the relationship of the State to rural development in Massachusetts. Among other duties suggested for the commission are to collect all state laws bearing on agriculture and country life and the formulation of a new code; advice as to the best methods of aiding agriculture and the form of organization for boards and institutions to carry out the desired policy; and the securing of cooperation among all agencies designed to benefit agriculture and country life.

As a working program, he suggests the following: (1) Secure the best use of present cultivated areas, (2) develop the waste and unimproved areas, (3) help the farmers to secure an adequate farm labor supply, (4) establish a better system of rural credit, (5) devise a more efficient system of marketing, (6) perfect the system of agricultural education, (7) get and keep the right kind of people on the land, and (8) secure a fairly complete organization of agriculture and country life.

The attendance of the college is reported as 555, of whom 184 are in the entering class. Statistics collected in this class indicated that approximately one-third came from farms, while two-fifths have had no farm experience. Of the 147 members who reported a decision as to their life work, 94 per cent intended to follow an agricultural vocation.

The estimates of the college for the ensuing year include increases of $15,000 for experimental work, $20,000 for instruction, $55,000 for general improvements and repairs, and $210,000 for a three-story and basement agricultural building.

Michigan College.—The department of agricultural education is planning to assist the county commissioners of schools in working out a scheme for the promotion of interest in, and knowledge of, rural and home life among the young people of Michigan. A suggestive constitution which outlines the general plan of organization and work is given in *Moderator-Topics* for October 31.

Nebraska University and Station.—Vernon V. Westgate has resigned as assistant professor of horticulture and assistant horticulturist to become assistant professor of floriculture and gardening in the Washington College. T. V. Moseley and O. H. Liebers have been appointed instructors in agricultural botany and dairying respectively.

Cornell University.—Miss Clara Nixon, assistant in poultry husbandry, has resigned for further study at the Oregon College.

Pennsylvania College and Station.—C. R. Orton, assistant botanist of the Purdue Station, has been appointed assistant professor of botany, vice H. R. Fulton, whose resignation has been previously noted.

Porto Rico University.—The first of the series of agricultural institutes which are to be held in most of the school districts of Porto Rico was recently given at Mayaguez. It extended through one week and was attended by 126 teachers. The instruction was given by instructors of the college of agriculture, and included seed selection, plant propagation, and maintenance of soil fertility. It is planned to have small gardens in connection with rural schools, as well as graded schools, where land is available.

Rhode Island Station.—Dr. B. L. Hartwell has been appointed director.

Vermont University.—In accordance with a joint resolution of the legislature, an educational commission has been recently appointed to inquire into the relationship of the Vermont institutions of higher learning to the State. The personnel of the commission is as follows: Assistant Justice John H. Watson, of the State Supreme Court, chairman; President Nicholas Murray Butler, of Columbia University; President T. N. Vail, of the American Bell Telephone and Telegraph Company and the Western Union Telegraph Company; State Auditor of Accounts H. F. Graham, of Craftsbury; Mayor James F. Estey, of Montpelier; Ex-President P. W. Clement, of the Rutland R. R.; Hon. F. H. Brooks, of St. Johnsbury; Hon. E. H. Porter, late of the Vermont Public Service Commission; and Hon. A. E. Tuttle, of Bellows Falls, president of the State Teachers' Association.

Macdonald College.—The following appointments have recently been made: Wilfrid Sadler, of the Midland Institute, England, assistant in bacteriology, W. M. Aikenhead assistant in horticulture, and Alex R. Ness assistant in animal husbandry. Prof. W. S. Blair has resigned the chair of horticulture and accepted the positions of superintendent of the Kentville, Nova Scotia, Experimental Fruit Farm and Dominion maritime horticulturist. The following graduates have been appointed district demonstrators—local representatives of the college, whose function is to promote interest in scientific agriculture and to advise farmers on scientific questions—G. W. Wood, L. C. Raymond, A. A. Campbell, L. V. Parent, and R. Newton.

Canadian Experimental Farms.—Dr. O. M. Malte has been appointed dominion agrostologist, E. S. Archibald dominion animal husbandman, and O. C. White assistant dominion field husbandman.

American Association of Farmers' Institute Workers.—The seventeenth annual meeting of this association was held November 11 to 13, at Atlanta, Ga., with representatives from 36 States, 2 Provinces of Canada, Porto Rico, and the District of Columbia.

The address of the president, Franklin Dye, was a discussion of the general agricultural situation in the United States, and specifically of some of the

problems with which the farmers' institutes must deal. Among these were wastes through improper farming, lack of method in marketing, and waste of food in the kitchen and of plant food on the farms and through the maintenance of unprofitable animals.

The committee upon institute organization and methods recommended a change of the organization unit, holding that the county is too large an area in most of the States, and that with the township or community unit, all farmers could attend and monthly meetings could be held in many localities. The committee on cooperation with other educational agencies recommended the appointment of a national commission of agricultural education, whose duty it should be to map out the fundamental functions of the different types of educational institutions, and to recommend ways in which a balanced system of agricultural education can be developed with the greatest efficiency and a minimum of duplication. This matter was referred to the executive committee for action. Reports were also received from the committees on institute lecturers, movable schools of agriculture, and women's institutes.

The first topic in the general program was the special province of the farmers' institute. The conclusions reached were that there should be in the modern institute meeting a well defined purpose to make it prepare for more specialized and advanced kinds of extension. The field of the institute is distinctive but not exclusive, and lies chiefly in new territory where there are no facilities for such undertakings as farmers' short courses and the like. The institute also has a place in organized territory where the short course has come, the agricultural train has passed, and the movable school of agriculture has been held.

As regards the relative value to the farmers of the one-day and two or three-day institutes, it was concluded that one-day institutes, although requiring the maximum expense in time and travel, are useful and economical in communities where the families are widely scattered or where the institute habit has not been established. Two-day institutes are a logical sequence to the one-day institute, and more economical of time in the field. The three-day institute enables the workers to do a higher grade of instruction work so far as the individual is concerned but reaches fewer persons. As yet, all three types are deemed necessary, according to the special needs of each community.

The relation of the institute to the agricultural college and experiment station was discussed by G. A. Putnam, who called attention to the fact that the institute system must be prepared to cooperate with the various other forces at work for the betterment of agricultural conditions, and that the relationship between the college faculty and experiment station staff and the farmers' institute workers should be of the closest and most cordial character.

The use of the round-table method was declared to be very helpful in creating interest and in imparting information, and should be more generally adopted. Plans for organizing institutes for women and young people were suggested and the system in use in Oklahoma was quoted as having been entirely successful.

Dr. Tait Butler discussed the desirability of an agricultural journal giving information regularly respecting farmers' institute and other forms of extension work, holding that such a journal would be desirable but impracticable from a financial point of view because of the limited constituency, unless supported by state or national appropriation. In the subsequent discussion of the topic, attention was called to a journal, published by the Department of Agriculture of the Province of Quebec, that had been successful and self-supporting, and to a similar publication in Australia. In both of these instances farmers' organizations receiving state aid were required to subscribe for a sufficient number of copies to supply their members.

The character of the state director's annual report was considered by F. S. Cooley, and held to be governed by whether it is prepared for the farmers' institute board, the legislature, or the general public. The speaker held that the most valuable form of publication for the general public is that which treats rather completely of a single subject, such as corn growing or the care of poultry. In the discussion of this topic attention was called to the use that could be made of separates from the report.

Under the general heading of agricultural cooperation, H. C. Price described the Landschaften, Raiffeisen, and Schultz-Delitch systems of obtaining credit. A manual giving exact information for the formation of the Raiffeisen banks, which had been translated from the French by this Office, was also presented.

Agricultural Cooperation for the Purchase of Supplies was discussed by J. A. Herr, who for some years has been at the head of an organization of this character in Lancaster County, Pennsylvania, and Cooperation for the Preparation and Selling of Agricultural Products, by G. A. Gigault and W. H. Ingling. B. B. Hare, of this Office, presented a summary of data on cooperative fire insurance.

A. L. Cance, in a paper upon Agricultural Cooperation for Providing Farm Labor, stated that no very satisfactory method had yet been discovered for providing farm labor at seasons when most needed. Methods that had been used in various countries were through the formation of cooperative societies to procure laborers from foreign countries or from urban centers and distribute them under contract among the members of the association, through the cooperative employment and use of crews of laborers for special tasks, such as the weeding of vegetables or the gathering of fruit, through the formation of a cooperative or corporate association of the laborers themselves for the purpose of performing certain services, and through collective farming, either by small farmers or by gangs of laborers who obtain land on which to conduct agricultural enterprises in common. Of these propositions the speaker regarded that of the cooperative farm labor bureau and the cooperative employment of labor crews for the year or season as the most hopeful under our conditions and as most immediately practicable.

The federation of agricultural organizations was discussed by C. W. Pugsley, who held that while such a federation could exert a powerful influence, there has as yet been reluctance to sink individuality for a common purpose. He expressed the opinion that any sort of a rural organization or federation, to be of the greatest use, must enroll in its membership a large number of farmers and that its demands and work must be largely directed by the rank and file of the farming classes.

Two round-table discussions were scheduled, the first upon The Use of Illustrative Material in Institute Teaching, conducted by G. I. Christie, and the second upon How Farmers' Institutes Can Assist in the Formation of Cooperative Agricultural Organizations, by A. M. Soule. Both of these round tables revealed the great value of this method of giving instruction in the farmers' institute work.

The officers chosen for the ensuing year were A. O. Sandles, Columbus, Ohio, president; J. H. Miller, Manhattan, Kans., vice president; and John Hamilton, Washington, D. C., secretary-treasurer. The executive committee consists of the president, the secretary-treasurer, R. W. Thatcher, Pullman, Wash., Mrs. F. L. Stevens, Mayaguez, P. R., and Andrew Elliott, Galt, Ontario.

American Association for the Advancement of Agricultural Teaching.—This association held its third annual meeting in Atlanta, November 12, with a program which included three topics for discussion and two reports of special committees.

The opening discussions on The Opportunity and the Responsibility of the Agricultural Colleges for the Preparation of Teachers of Agriculture were made by Dean Russell of Wisconsin and President Butterfield of Massachusetts, the former dealing with the work of the agricultural colleges in training teachers of agriculture through their regular courses and classes, and the latter with special courses and classes organized for this work.

Both speakers recognized the responsibility of the agricultural colleges to undertake the training of teachers of agriculture, particularly for high schools, not only by arranging regular groups of study, but also by providing special facilities through summer schools, movable schools, correspondence courses, etc., for the training of teachers now in service and others who wish to keep in close touch with the work.

D. J. Crosby, of this Office, in opening the discussion on these papers called attention to the rapid development of teacher training courses in the agricultural colleges, and emphasized the importance of giving some attention to the professional side of teachers' courses—to educational psychology, pedagogy, the history of education, agricultural pedagogy, and practice teaching. Dr. True, of this Office, emphasized the fact that in preparing teachers the agricultural colleges have a very complicated problem on their hands, that of preparing teachers for high schools, for the agricultural colleges, and for extension work.

R. W. Stimson, of Massachusetts, thought that not enough instruction in agriculture is being given to prospective teachers, and suggested cutting out higher mathematics, language, and other nonessentials in order that students in teacher training courses might take practically all of the agriculture offered by the college.

The Content of the First Year's Work in High School Agriculture was the topic discussed by W. G. Hummel, of California. Professor Hummel called attention to the need of a general course in the first year of the high school to give the students a proper outlook toward various sciences that they may be called upon to pursue in subsequent years, and outlined a course in agriculture which he had used for several years in California as a means to this end. This course follows very closely that of the secondary course of agronomy published in Circular 77 of this Office, previously noted (E. S. R., 19, p. 793). Running parallel with this course are suggestions for studies and practicums in physiography, botany, chemistry, physics, and geology, so that the pupil who pursues this work not only has a logically developed course of study, but also gets an insight into the beginnings of natural science as they are related to agriculture. This paper was discussed by F. B. Jenks of the Bureau of Education.

At the second session of the convention, President Soule of Georgia read a paper on What Relation Should Exist Between the Experiment Station and Secondary Schools of Agriculture, in which he maintained that secondary schools of agriculture should not attempt research work in agriculture. This position was unanimously approved by the association.

R. W. Stimson presented a progress report upon the use of land in connection with agricultural teaching, in which he gave results of correspondence with a considerable number of teachers of agriculture. He also described the Massachusetts plan of high school instruction in agriculture in which practice for the pupils is secured by having them conduct home projects in gardening, fruit growing, dairying, and animal husbandry. The committee was continued.

F. W. Howe, of Syracuse University, presented a very brief progress report on The Cooperative Use of Equipment and Illustrative Material.

The officers elected for the ensuing year were D. J. Crosby, president; R. W. Stimson, vice president; W. H. French, secretary-treasurer; and W. G. Hummel, K. L. Hatch, and F. B. Jenks, additional members of the executive committee.

A committee on terminology, consisting of D. J. Crosby, A. F. Woods, and K. L. Hatch, was appointed to recommend terms to be employed in designating field practicums, for which such words as "experiments," "field tests," "field trials," "projects," and "problems" are now loosely used.

American Society of Animal Nutrition.—This society held its annual meeting at Chicago, Ill., November 30, 1912. Besides the routine business of the society it was voted to change the name of the organization and enlarge the scope of the work so as to include discussion of problems connected with breeding, judging, and management of live stock in addition to investigations in animal nutrition.

The address of President H. J. Waters, of Kansas, consisted of a report of investigations on the effects of different proteins and ash constituents on the growth of swine. A detailed abstract of this paper will be noted in a later issue.

E. W. Morse, of this Office, presented a paper entitled Suggestions Concerning the Planning and Reporting of Feeding Trials. He recommended the planning of feeding tests in such a way that the results obtained could be treated by modern biometrical and statistical methods, and that the work as a whole should be so systematized and coordinated that the results of each investigator can be compared with those obtained by others. It is realized that at the present time the work is so uncorrelated that a compilation of results on any uniform basis is out of the question.

The standing committee on methods of reporting results of feeding experiments made a special report which likewise contained recommendations urging uniform methods of reporting data of feeding experiments. These recommendations were based to a large extent upon a summary of opinions expressed by a large number of investigators in response to a questionaire previously submitted by the committee to members of the society. After a brief discussion these recommendations were adopted.

The society voted to meet at the Pan-American Exposition in San Francisco in 1915.

Association of Feed Control Officials of the United States.—The fourth annual convention of this association was held in Washington, D. C., November 18 to 19, 1912. Definitions of cotton-seed meal, gluten feed, oat clippings, white wheat middlings, and gluten meal were among the special subjects for discussion. Other subjects considered were uniformity and the manufacture and control of feeding stuffs generally. The papers presented are listed on page 74 of this issue. Officers were chosen as follows: President, J. D. Turner of Kentucky; vice president, T. J. Bryan of Illinois; secretary, G. M. MacNider of North Carolina; and executive committee, the president and secretary, ex officio, C. D. Woods of Maine, J. K. Haywood of this Department, and L. F. Brown of New York.

Private Cereal Station in California.—According to a note in *Orchard and Farm*, the Sacramento Valley Grain Association has been incorporated to provide land and equipment for a cereal station, to be located about three miles north of Biggs in Butte County, Cal. This station is to be supported by subscriptions and the donors will receive or may sell the surplus seed grain produced. The development of new and more profitable crops for the valley is expected.

A Training School for Agricultural Teachers.—According to *Moderator-Topics*, the Michigan State Board of Education has recently designated the Central State Normal School as the training school for the preparation of teachers of agriculture in the public schools of the State. The state legislature at the coming session will be asked to appropriate sufficient funds with which

to construct an agricultural and general science building with suitable lecture rooms, laboratories, etc., and purchase a demonstration farm.

Princeton University Farm.—According to the *American Agriculturist*, the farm purchased by Princeton University in the spring of 1912 has proved a boon to poor students who work their way through college. Twenty-five acres were put in cultivation, and fifteen students were given work during the summer vacation. Their profits, in vegetables and fruits, after paying all expenses, were $90 each. A small canning factory was installed to utilize the surplus production, and this allowed the employment of more men.

Boy Scouts of Michigan.—The State of Michigan is endeavoring to turn the boy scout movement to practical utility by organizing the scouts into companies of fire wardens, under the direction of the State Game, Fish, and Forest Warden, W. R. Oates, and the State Fire Marshal, C. A. Palmer. J. H. McGillivray has been appointed supervisor in the field to organize the movement. The forestry department of the Michigan Agricultural College is cooperating in this movement. No boy is expected to risk his life in fighting fires, but rather to assist in notifying the fire warden in his vicinity when a fire is discovered. A system of tests for membership in the organization and of rewards for services performed have been adopted.

The deputy forest warden is also planning to have 5,000 boys plant pine seedlings next year on newly cut-over lands. The seedlings will be secured from the agricultural college plantation, and the railroads will deliver them to the boy scouts free of charge. An honor medal for service is to be given to each scout or company of scouts making a showing in planting the seedlings.

Additional Agricultural Assistance in Wales.—Prof. Bryner Jones, principal of the agricultural department of the University College of Wales, at Aberystwith, has been selected as the first commissioner of agriculture for Wales, with his primary duty to advise the Board of Agriculture and Fisheries as to prospective grants from the Development Fund to Wales, and on the agricultural work of the country generally. There is also to be an agricultural council for Wales, which will meet every six months for the discussion of agricultural questions.

Departmental and Communal Agricultural Instruction in France.—A law of August 21, 1912, reorganizes the departmental and communal agricultural instruction in France. It establishes in each department a bureau of agricultural services, to replace the departmental professors of agriculture previously authorized. This bureau is to have charge of the dissemination of agricultural knowledge, agricultural instruction in public education institutions, economic and social aspects of agriculture, including agricultural insurance and rural hygiene, agricultural information, statistics, direction of experiment fields, technical researches and commissions, and in a general way of all agricultural interests with the exception of the veterinary and forestry services in the agricultural stations.

The departmental professors of agriculture will be known hereafter as the directors of the agricultural services and will be assisted by special professors, having charge of certain local districts. Both the special professors and directors will be subject to the general supervision of the Minister of Agriculture.

New Journals.—*Zentralblatt der Experimentellen Medizin* is a new semimonthly abstract journal devoted to experimental pathology and pharmacology, which will succeed *Zentralblatt für die gesamte Physiologie und Pathologie des Stoffwechsels.*

Boletin de los Trabajos de la Comision Central para la Extincion de la Langosta is being issued by the Commission on Locust Control of Colombia. The

initial number gives the text of the law establishing the commission, the regulations issued in the work, and circulars of information as to means of combating the pest.,

The Creamery and Milk Plant Monthly is a new monthly devoted especially to the interests of creamery and milk plant operators. The initial number contains several articles on milk inspection, including one by B. H. Rawl, of the Dairy Division of this Department, on How Proper Inspection Can Aid the Creamery, and also contains abstracts of a number of scientific articles.

Tennessee Agriculture is being published monthly by the Tennessee Department of Agriculture. The initial number contains the rules and regulations governing live stock sanitary control work in the State.

The October number of the *Northwest Journal of Education* announces the addition of a new section of elementary agriculture, to be conducted by Director R. W. Thatcher, of the Washington Station. It is planned to present each month a few "notes" on current happenings in the field of agricultural instruction which will be helpful to teachers of the subject, followed by outlines of experiments and suggestions for illustrative material to be used in class work.

The initial number of the *Rural Educator*, a national monthly magazine for the promotion of rural and agricultural education, has just appeared. The purpose of the magazine is announced as to voice the sentiments of the leaders in rural life and agricultural education, to serve as a medium for the rapid communication of ideas on these subjects, and to give helpful suggestions to rural teachers, preachers, and social leaders.

Miscellaneous.—At the sixty-fourth meeting of the American Association for the Advancement of Science, held at Cleveland, Ohio, December 30 to January 4, the constitutional amendment proposed at the previous meeting establishing Section M, Agriculture, was adopted.

The Brazilian Government has acquired the grounds at Rio de Janeiro used in 1908 for the exposition, and will utilize them for practical experiments in agriculture and horticulture.

Cambridge University has received a grant of $72,500 for building and equipping an extension to the school of agriculture to accommodate research work in plant breeding and animal nutrition.

A section of foreign students has been established in the French National Institute of Agronomy. The students will be selected through an examination similar to that required of regular students, but after admission they will constitute a separate class. The number to be admitted annually will be restricted to 10.

The agricultural curriculum of the University of Leipzig has been extended by the establishment of a professorship of colonial and tropical agriculture, to which Doctor Arthur Golf has been appointed.

The New York legislature has authorized the commissioner of agriculture to make an examination and investigation of the horse-breeding industry, for the purpose of stimulating and promoting the breeding of horses in New York State.

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How best to provide the agricultural student with insight into the practical aspects of his intended vocation is a question which has perplexed educators from the beginning and assumed special prominence in recent years. The early conception of the agricultural college as primarily a trade school for farmers found a logical expression in compulsory student labor and similar devices, long since abandoned when it was realized that, as Senator Morrill said, "not manual but intellectual instruction was the paramount object." Then came a period when the student unfamiliar with farm work was thrown largely upon his own resources for obtaining practical training. It was assumed that if he was not already equipped in this regard, he could meet most necessary requirements by the mere observation of farm operations at the college or elsewhere. Any other deficiencies he was expected to overcome by his own initiative as he encountered them in his subsequent career.

Both the compulsory labor and the *laissez-faire* policies proved inadequate to prepare the average student for actual life on the farm, and more and more reliance has come to be placed on what may be termed the laboratory method. The student is now being taught to prune, to spray, to judge grain and cattle, and to operate the gasoline engine and the cream separator, much as his friend in the medical school is taught his profession in the clinic or the embryo lawyer in the moot court. Such training, if properly supplemented, is generally conceded to be sound pedagogically as well as of great practical utility. In itself, however, it still falls short of the requirements stated by Dean Bailey for the would-be graduate student of "sufficient actual contact with farm work and farm life to make him competent to estimate the farmer's position and to judge the rural mind." Even more, of course, does it fail to meet the demands by the prospective farmer, the farm manager, or the extension worker for "actual farm experience."

Largely in response to these demands, various means are being devised to meet the conditions now prevailing, and in some institutions definite requirements of farm experience must be satisfied by

the student before he obtains the bachelor's degree. The advisability of such requirements was a subject for discussion at the Atlanta meeting of the Association of American Agricultural Colleges and Experiment Stations, and ways and means for meeting them were outlined by several speakers before the American Farm Management Association at its recent meeting in Washington. The question is to be taken up for study by the committee on instruction in agriculture of the former association, with a view to reporting on it at the next convention of the association.

Two factors seem to have been mainly responsible for the acute interest in this problem. One of these is the large and steadily increasing number of students now matriculating in agricultural courses from the cities and towns. So long as nearly all applicants came from the farm a requirement of farm experience was largely an academic proposition, but the widespread interest in country life is now reflected at many agricultural colleges by enrollments in which the farmer's son is in the minority. For instance, data recently collected at the Massachusetts Agricultural College showed that of its entering class of one hundred and eighty-four only one-third came from the farm, and that although ninety-four per cent of those members who had reached a decision intended to follow an agricultural vocation, two-fifths had had no farm experience. Similar figures are reported from the Illinois College of Agriculture, where out of seven hundred and fifty-six students registering in 1911–12, only two hundred and forty-six came from the farm. The New York State College of Agriculture recently found that whereas ten years ago ninety per cent of its students in farm crops came from farm homes, to-day but forty per cent are from the country.

The second factor which has emphasized the value of farm experience is the recent development of farm management courses, farm surveys, the provision of county experts, and similar undertakings. In these much attention has naturally been directed to the business aspects of farming. Studies have been made of the existing practice of farmers, especially of those securing notable financial returns. The heavy demand recently developed for extension workers, county agents, farm managers, and similar positions in which actual experience is regarded as one of the principal qualifications, has likewise served to bring into prominence the great practical utility of farm training as a basis for sound judgment and advice.

Under conditions such as these it is not surprising to find a tendency in the colleges of agriculture toward the formulation of definite requirements in farm experience. A recent inquiry by Dean Burnett, of the University of Nebraska, showed that of forty-six institutions reporting, seven now require an examination in the subject or

in lieu thereof a summer residence at the college or on approved farms, and that eight other institutions favor such action although not as yet insisting upon it.

The New York State College of Agriculture was one of the first to announce formal requirements in connection with the four-year course. Under the plan adopted male students, except those specializing in forestry, landscape art, entomology, or plant breeding, must satisfy before the beginning of the senior year requirements in farm practice embodying a practical knowledge of horses, cattle, sheep, swine, poultry, crops, farm machinery, orcharding, gardening, butter and cheese making, etc. Somewhat similar requirements are made at the Ontario Agricultural College, where the candidate for admission must present a certificate of having spent at least one year on a farm and must have a practical knowledge of the ordinary farm operations.

At the University of Minnesota six months' practical farm experience is required of each candidate for the bachelor's degree in the college of agriculture. It is expected that this work will be done on a selected farm, on which improved methods and appliances are in use. It may be performed during the summer vacation, under the guidance of the head of the department in which the student is specializing.

The Ohio State University requires practical experience in agriculture or horticulture of applicants under twenty-one years of age desiring admission to the two-year courses. An interesting feature is its "apprentice two-year course in animal husbandry," in which students spend four years in alternate periods of one year each at the university and on selected stock farms.

These instances, cited as typical of the prevailing requirements, indicate a considerable diversity of opinion among educators as to the form most desirable in case requirements are attempted. This is perhaps fortunate, for the whole question is admittedly complex and its solution dependent to a large degree upon varying local conditions and special considerations.

The ultimate purpose of the student is also to be considered. For instance, the institution of college grade, in training men for agricultural work, does so along broad lines and includes many specialized fields of activity. Preparation must be afforded, so far as this is possible in undergraduate courses, for the future agricultural chemist, the entomologist, the plant pathologist, the soil expert, and the rural engineer, the teacher in the secondary school or in the college, and the extension worker, as well as for the dairyman or the fruit grower or the poultryman. Farm experience has a value for all of these, but obviously in varying degree. It may easily be

that the practical training so useful to the farmer or farm manager is by no means an inflexible *sine qua non* for the rural engineer or the station investigator. But even in this respect too narrow specialization seems unwise.

Again, what is termed "farm experience" is by no means a fixed pedagogic quantity. Two of the main reasons which have been advanced for making it a requirement for admission are (1) that the student who has obtained it is better able to pursue his college work in agriculture, and (2) that after graduation he is better able to understand the problems with which he comes in contact. The extent to which these reasons hold good is controlled in part, however, by the kind of farm experience he can obtain. Indiscriminate training suggests the possibility of limited benefit and even of some objections.

It is no reflection upon existing farm practices to point out that they are in no sense to be endorsed as a standard of perfection, for the whole theory of agricultural education rests upon the possibility of improvement. This being so, can the boy fresh from the town or city be expected to discern between what is really sound practice and what is perhaps based merely on the rule of thumb or tradition? Valuable as are the object lessons afforded in studies of farm practice, it is evident that without wise interpretation they will retard rather than advance scientific agriculture by fostering the conclusion that if a farm is apparently successful, "whatever is, is right."

Coupled with this difficulty is the similar one from the pedagogic standpoint that while the boy will acquire much useful information, it will be rather on how to do than on how to think. This, of course, might eventually be obviated by his college instruction, yet it can not be too often emphasized that, as Director Jordan pointed out at the Atlanta meeting, what is most needed on the farm is understanding, and that "it is the trend of mind that succeeds and not the man who is in possession of facts."

Still another drawback to arbitrary requirements, which readily suggests itself, is the highly specialized nature of many lines of agriculture and the consequent lessened applicability of farm experience of a different type from that ultimately followed. The advantage to the future dairyman of a summer on an up-to-date dairy farm is unquestioned, but doubt has been raised whether the prospective soil chemist or market gardener or grain farmer should be put through the same mill in acquiring farm experience. However, the value of the practical experience probably does not depend so much on the kind of farm or horticultural plantation on which it is obtained as on the doing of the actual work, whatever it may be, in a practical way. The chief thing is that the student shall really understand how seasonal or other uncontrollable causes may upset traditional practice

or even counterbalance scientific management, and shall come to realize what work on a farm means, both as a physical exercise and as a mental discipline in the adaptation of means to useful ends. But even bearing this in mind, a certain degree of selection or specialization may be advantageous.

It may be that the solution of these and other problems will be found in a greater differentiation of the courses of study along practical and technical lines. Such a separation, it is of interest to note, was advocated at the Atlanta meeting by Prof. M. F. Miller, who said in part: "It seems to me that most institutions are to-day maintaining a single course designed to train both practical and technical men, with the result that they are not providing the most efficient training for either class. In the majority of cases, our technical men go out deficient in fundamental training and our practical men deficient in practical training. . . . I believe that a number of our first rank institutions have reached a place where they should differentiate sharply between courses of study for technical men and courses of study for practical men."

In whatever way provision is made for the practical training of students, the conclusion seems warranted that if an institution is to require farm experience it must accept the responsibility of adequately providing and supervising it. Various plans are already in operation with this end in view, those best developed being the system of so-called "accredited farms" in Wisconsin and Minnesota. In this system, as is well known, a small number of farms are carefully selected with reference to their type and progressiveness, the interest likely to be manifested in the student's welfare, and similar considerations. Students are then apportioned among these farms so far as possible.

In the case of the University of Minnesota additional opportunity is also being afforded to a few selected students in farm management by the novel and suggestive plan of leasing fully equipped private farms, putting a student in charge for a year under the close supervision of the department, and allowing him to share in the net profits. A certificate of proficiency in farm management is awarded upon the successful completion of such a course, in addition to the regular diploma.

As far as the colleges are concerned the problem is likely to assume a different phase with the introduction of agricultural instruction into large numbers of the secondary schools. The student may then not only derive advantages from the school farms but also engage in practical work at or near his home during a large part of the year, including especially the long summer vacation, and thus get considerable practical experience prior to taking his college course.

Various plans are already being worked out to afford this sort of training. For instance, in the scheme proposed by the Massachusetts State Board of Education, the instruction in agriculture is largely individual, and each pupil is assigned a project to be carried out on the home farm under the supervision of the instructor. The school work in agriculture is concentrated in the fall and spring terms, and the summer term is devoted almost entirely to field work on these projects, for which, of course, school credit is given. The projects increase in difficulty as the student goes on, those of the first year being of a simple nature such as kitchen gardening on a small scale, the second year dealing with the smaller animals, such as poultry, swine, or bees, the third year with market gardening or orcharding on a commercial scale, and the fourth year with the larger animals, as in dairying or beef production.

A very similar plan of home projects has been in operation for about two years in the Baltimore County (Md.) Agricultural High School. It is also being introduced into the agricultural high schools of Minnesota and other States.

It would seem that means such as these, if they are found feasible for large numbers of students and can be supplemented by appropriate college work, would do much to increase the benefits of practical training and to minimize the possibilities of small educational returns or even positive exploitation of the inexperienced student. In fact, it may be questioned whether if attractive opportunities are provided for the earnest student, compulsory training will be found necessary. Much may be done by wise recommendations. The city or town bred boy sufficiently interested in farm life to enter the agricultural college soon comes to realize in most cases the handicap under which he is laboring, and can easily be shown that it is much to his personal advantage to familiarize himself with practical conditions, especially if good facilities are made available. The benefits can also be forcefully presented to the farm boy in accordance with his particular needs. In addition, the institution can exert an influence in this direction by the weight which it gives in its recommendations of graduates for positions calling for practical farm training.

The advantage of these methods lies in the fact that the student's own inclinations are regarded and the problem is met as mainly one of individuals. Because of its admitted complexities there is much reason to believe that in many of its bearings it is precisely this kind of problem.

It may also be pointed out that in any case too much practical proficiency should not be expected of the graduate in agriculture just out of college. Even though he has been able to supplement his academic courses with considerable practical knowledge, his training is quite

different in nature from that of an apprentice. More closely does it correspond to that of the graduate in engineering, who must usually serve several years as a subordinate before he is entrusted with positions requiring great executive ability or responsibility. The college-trained agricultural expert of the future, like the college-trained engineer of the present, will reap great benefits from whatever practical experience he may be able to obtain; but for neither will it be found to admit the bearer immediately to the highest positions of his vocation, nor will it be accepted in any broad sense as even a substitute for the proper fundamental preparation. This is something which the student and the public alike need to realize.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A chemical study of the seeds of sugar cane, E. W. Cross and W. G. Taggart (*Internat. Sugar Jour., 13 (1911), No. 151, pp. 362–365; abs. in Zentbl. Biochem. u. Biophys., 12 (1912), No. 19–20, pp. 778, 779*).—The following table gives the results of examining sugar-cane seed from various sources:

Composition of sugar-cane seeds.

Variety.	Water.	Protein.	Fat.	Pentosans.	Soluble carbohydrates.	Lignin.	Fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Antigua	10.75	6.23	1.98	25.72	1.23	12.71	27.16	14.22
T 105	11.00	8.38	1.99	29.75	1.03	12.78	28.87	6.20
Lahaina	11.53	7.44	1.64	23.00	0.64	21.57	27.17	7.01
Hawaii 29	11.30	8.64	1.95	25.10	0.66	16.04	25.73	10.58
Barbados 306	11.28	6.13	1.72	24.34	1.41	22.09	25.55	7.48

As the seeds were very small it was was difficult to remove the seed coats or hairs from them. The variations in the amount of lignin and the soluble carbohydrates, noted in the above table, are probably due to the varying degrees of ripeness which the seeds possessed.

The water-soluble carbohydrates consisted of reducing substances, i. e., glucose, but no cane sugar could be noted. In detecting the insoluble carbohydrates 60 gm. of the seed was added to 2 liters of a 5 per cent sodium hydrate solution and placed for 1 hour in boiling water, and the residue pressed out and washed thoroughly with cold water. The process was then repeated.

The hemicellulose was precipitated with acidified alcohol, purified, and 25 gm. hydrolyzed by heating for 4 hours at 120° C. with 1½ per cent sulphuric acid. Xylose and arabinose (traces) were present; galactose and methyl pentosans could not be detected. The cellulose consisted of glucocellulose; mannocellulose was not present.

Composition and digestibility of the ether extract of hays and fodders, G. S. Fraps and J. B. Rather (*Texas Sta. Bul. 150, pp. 5–29*).—The authors found that the ordinary method of shaking out the unsaponifiable matter from the soap solution with ether can not be employed for the ether extract of hays and fodders. It was therefore necessary to make certain modifications in the existing methods for the separation of the saponifiable from the unsaponifiable matter. The procedure given includes the extraction of the substance for obtaining the ether extract, the saponification process, and the extraction of unsaponifiable matter, dealing with the emulsions obtained in some cases and the extraction of the saponified matter.

The method calls for extraction first with petroleum ether, then with ethyl ether. Both of the solvents were found to take up soap and from one-third to

one-fifth of the ethyl ether extract consisted of fatty acids. It was noted, however, that if the ethyl ether extraction were eliminated from the process the method would not be increased in accuracy, because it would leave a large quantity of unsaponifiable matter with the fatty acids. A correction was therefore introduced in the method for the fatty acids extracted with the unsaponifiable substances.

Methods for extracting larger amounts of material are also included in what is termed "the large scale method." The saponifiable materials from hays, fodders and excrements were found to consist of fatty acids, clover products, and perhaps other substances. The average saponification number of 18 feed extracts was 203 and for the extracts from the excrement obtained as a result of feeding the hays and fodders it was 167. "That is to say, the average fatty acid of the feed would correspond to daturic acid of the formula $C_{17}H_{34}O_2$ (or a mixture of equal proportions of palmitic and stearic acids), while that of the excrement would be erucic acid $C_{22}H_{42}O_2$. Thus the fatty acids of the lower molecular weight are more easily digested. The melting points of the saponified products are also, as a rule, higher for the excrement than for the feed."

"The unsaponifiable material is composed largely of wax alcohols. A crystallized alcohol approximating myricyl alcohol was separated out [from bur clover], and alcohols of lower molecular weight are present in the mother liquor. The unsaponifiable matter of the hays and fodders extract varies from 36 to 72 per cent, with an average of 58 per cent. The average amount of lecithin would be 1.25 per cent, if all phosphoric acid is so present. The average amount of chlorophyll derivative, based on the nitrogen present after correction for lecithin, is 6.4 per cent of the saponifiable. The digestibility of the unsaponifiable varies from 0 to 86.6 with an average of 29.1. The digestibility of the saponifiable varies from 8.6 to 92.3, with an average of 66.4."

The term "fats or oils" to designate ether extract of hays and fodders is considered incorrect.

The other data contained in the bulletin relating to the digestibility of the ether extract of hays and fodders have been previously noted (E. S. R., 28, p. 69).

Volatile fatty acids and alcohols in corn silage, E. B. Hart and J. J. Willaman (*Jour. Amer. Chem. Soc., 34 (1912), No. 11, pp. 1619–1625*).—The object of this work was to determine the kinds of volatile fatty acids present in corn silage, the amounts of each, and the amounts and kinds of alcohol present. The silage was obtained from a concrete silo at the University of Wisconsin farm and at a time when it was completely ripened and being fed to the stock.

The total acidity of the silage was equivalent to 160 cc. of decinormal alkali solution or 0.97 per cent by weight. "The volatile acidity was equivalent to about 140 cc. of tenth-normal alkali, or 0.84 per cent by weight (as acetic acid). Of the total volatile acids, 17 per cent was formic, 75 per cent was acetic, 8 per cent was propionic, and 0.6 per cent butyric. No esters were found in this silage, but simply the free alcohols. A trace of aldehyde was also found. The volatile alcohols, expressed as their corresponding acids, amounted to 68 cc. of tenth-normal alkali, or 0.31 per cent by weight of ethyl alcohol. Of the total alcohols, 21 per cent was methyl, 72 per cent was ethyl, and 7 per cent propyl."

In regard to the occurrence of betain in green tobacco leaves, N. T. Deleano and G. Trier (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 4, pp. 243–246*).—Betain (glycocoll betain) was detected in green tobacco leaves. As the plants utilized contained a considerable amount of volatile bases and bases which are precipitated by phosphotungstic acid, a different method, which is described, was employed for the isolations.

A note on the determination of the digestive value of papain, J. R. RIPPETOE (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 517, 518*).—More satisfactory results can be obtained by conducting assays of papain in alkaline media. While some digestion by papain takes place in a 0.1 per cent hydrochloric acid solution, 0.2 and 0.3 per cent hydrochloric acid solutions inhibit the action of this enzym. See also the work of Graber (E. S. R., 27, p. 108).

On the coloring matters in alfalfa.—Alfalfa investigations, III, C. A. JACOBSON (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1263–1266*).—Continuing the work with alfalfa previously noted (E. S. R., 26, p. 802), the author reports the results on the coloring matter contained in this plant.

The results show that the chlorophyll obtained from alfalfa closely resembles that from nettle leaves. The leaves with which the author was working contained 66 per cent of neochlorophyll and 34 per cent of allochlorophyll. In air-dried alfalfa hay there was present 0.68 per cent of chlorophyll and 0.28 per cent of yellow coloring matter. This coloring matter did not seem to influence the chlorophyll absorption bands in concentrations which are most suitable for photographing. If, however, the concentration was increased fivefold two regions of absorption were shown in the ultraviolet.

Studies in the chlorophyll group.—XV, Methods for determining the components of chlorophyll (neo- and allochlorophyll), C. A. JACOBSON and L. MARCHLEWSKI (*Biochem. Ztschr., 40 (1912), No. 3–4, pp. 296–306, pls. 5, figs. 2; Amer. Chem. Jour., 48 (1912), No. 2, pp. 111–124; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 11–12, p. 414*).—The first of the two methods for determining the ratio of neo- to allochlorophyllan rests upon the characteristic properties which the absorption bands of these bodies possess in a violet and ultraviolet light. Purified chlorophyllan is dried at 100° C. to constant weight and a chloroform solution so prepared that 1 cc. contains 0.000004 gm. Stratas of the solution corresponding to 2, 4, 6, 8, 10 and 12 mm. are photographed, using the Nernst lamp of 60 candlepower as a source of light. The positives and negatives so obtained are compared with photographs showing the ultraviolet spectrum of artificial mixtures containing various amounts of allochlorophyllan and neochlorophyllan.

The second method utilizes the extinction coefficients of chloroform solutions of which 1 cc. contains 0.0004 gm. of the substance, with the aid of a Haraeus quartz amalgam light. In a cadmium light the neochlorophyllan coefficients are greater than those of the allochlorophyllan, while with the sodium light the reverse is the case. The pure chlorophyllans were obtained from chlorophyll prepared from *Acer platanoides* leaves.

Action of light upon enzyms, H. AGULHON (*Ann. Inst. Pasteur, 26 (1912), No. 1, pp. 38–47; abs. in Zentbl. Expt. Med., 1 (1912), No. 12, pp. 537, 538*).—The action of light upon aqueous solutions of a series of enzyms, viz, pepsin, rennet, emulsin, tyrosinase, amylase, peroxidase, etc., was studied. It was found that ultraviolet rays were the chief weakeners and destroyers of enzymic power. The process of destruction from this source was least when oxygen was absent.

In regard to the mode of action of phosphatese, II, H. EULER and H. OHLSÉN (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 5–6, pp. 468–477; abs. in Zentbl. Expt. Med., 1 (1912), No. 12, pp. 538, 539*).—Continuing previous work (E. S. R., 27, p. 407), a solution of glucose which had started to ferment with living yeast was carefully filtered to remove the yeast cells, then sterilized and exposed to the action of a dried yeast in the presence of a phosphate. The figure obtained was considered a measure for the synthetic activity of the phosphatese. An unfermented glucose solution can only be utilized when an extremely strong fermenting yeast extract is used. In experiments the esterifica-

tion was found to decrease with an increase in the phosphate content of the media.

Tests with Mitscherlich's methods of soil analysis, T. MARR (*Meded. Proefstat. Java-Suikerindus., 1910, No. 45, pp. 583–647, figs. 2*).—This is a description of the methods previously noted (E. S. R., 19, p. 911), and the results of a comparative study with other methods and Javan soils.

In regard to the determination of ammonia in soils, P. T. RESCHETNIKOV (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 17 (1911), No. 2, pp. 347–358*).—The following methods for determining ammonia were studied comparatively: Boussingault's method (distillation with the aid of magnesium oxid); von Schloesing's I (hydrochloric acid extract) and II (cold alkali); and Prianischnikow's method, extracting the soil by washing it with a potassium chlorid solution. Von Schloesing's method II yielded variable results, while the results obtained by the other three methods were uniform and comparable.

Determination of total manganese in soils, R. A. GORTNER and C. O. ROST (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 522–524*).—The Walters method for the determination of small amounts of manganese, described by Hillebrand and Washington for rocks, was not found applicable to Nebraska soils. In some instances 4 extractions of a 1 gm. sample of soil were necessary before all of the manganese was obtained in a soluble form. If, however, such soils are fused with sodium carbonate the solution of the melt, acidified with sulphuric acid, and the manganese oxidized by means of sodium bismuthate, all the manganese is oxidized to permanganic acid, which can then be determined colorimetrically. The authors claim that a method based on this principle possesses among other advantages greater rapidity of execution and absence from irritating fumes, and gives duplicate results.

Potash work of fertilizer division (American Chemical Society) with comparison of official method and a modified method) (*Jour. Indus. and Engin. Chem., 3 (1911), No. 9, pp. 699, 700*).—The modified method consists of washing 2 gm. of the substance on an 11 cm. filter with small amounts of boiling water, collecting the washings until they amount to 175 cc. in a 200 cc. flask, adding 2 cc. of a concentrated HCl-Am solution and ammonium oxalate, and proceeding as in the official method. Twenty-four analysts reported their results.

The modified method showed an average increase in potash soluble in water of 0.45 per cent. "Moisture determinations were reported at temperatures from 98 to 130°. Those made at 98 to 100° were from 3.65 to 5.18. Five hours seemed to be sufficient time to reach constant weight." The figures for moisture, however, are not included in the text.

Volumetric determination of phosphoric acid in phosphate rock, J. G. FAIRCHILD (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 520–522; Jour. Wash. Acad. Sci., 2 (1912), No. 5, p. 114; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 7, p. 350*).—The results obtained by the Pemberton method are usually 1.5 per cent too low. The error may be obviated by precipitating the soluble phosphates with an excess of barium chlorid. As barium phosphate undergoes hydrolysis the amount of precipitate taken for titration must not be too large, and the titration must be made within 15 minutes.

A new method for the determination of reducing sugars, E. C. KENDALL (*Jour. Amer. Chem. Soc., 34 (1912), No. 3, pp. 317–341; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 7, pp. 351, 352*).—As sodium hydrate when used in conjunction with Fehling's solution for estimating reducing sugars was found to cause a greater destruction of the sugar in question than sodium carbonate, which yields one-third more of reduced copper, tests were conducted for the purpose of substituting for sodium hydrate another alkali. After a series of experiments it was found that potassium carbonate was best suited to furnish

the alkalinity and salicylic acid to keep the copper in solution. It was also found that various samples of Rochelle salts varied in regard to their reducing power, making it necessary to apply a correction for each new lot of alkaline solution made up when using the Munson method.

"The sugar solution is made up to 100 cc. in a 200 cc. Erlenmeyer flask and 5 gm. of salicylic acid are added, followed by 15 cc. of a solution of copper sulphate (133⅓ gm. of the crystallized salt per liter) and 25 cc. of a solution of potassium carbonate (600 gm. of the anhydrous salt per liter), without agitation. (The reagents must be added in the order given.) After shaking with a rotary motion until the copper carbonate and salicylic acid are dissolved, the flask is placed in a bath of boiling water, the flame under which must be of such size that the water begins to boil again within 1½ to 2 minutes after introducing the flask. After heating for 20 minutes in this bath, the solution is filtered with the aid of suction through an asbestos felt, 6 to 8 mm. thick, supported on a porcelain disk in a glass funnel; the cuprous oxid is washed with hot water, the funnel is fixed in a clean suction flask, and the cuprous oxid dissolved in not less than 10 cc. of hot nitric acid (1:3), the asbestos being subsequently washed with successive portions (10 to 12 cc.) of water. The copper in the solution is determined by the author's modification of the iodid method.[a] The following equations show the relation between the weight of sugar (Y) and the weight of copper reduced (X) under the conditions described: Dextrose: $X=-0.17+3.0923Y-0.002026Y^2$. Invert sugar: $X=-1.30+3.2918Y-0.002455Y^2$. Lactose (hydrate): $X=-0.59+1.5786Y-0.000217Y^2$. Maltose (hydrate): $X=-1.69+1.5988Y-0.000187Y^2$. A table is given showing the weights of the four reducing sugars for quantities of copper from 30 to 450 mg. in steps of 1 mg."

Quantitative determination of salicylic acid in fruit juices, P. VIERHOUT (*Ztschr. Untersuch. Nahr. u. Genussmtl., 21 (1911), No. 11, pp. 664–666; abs. in Ztschr. Angew. Chem., 24 (1911), No. 31, p. 1491*).—The method is as follows:

To 50 cc. of the fruit juice 15 drops of sulphuric acid is added and shaken with 50 cc. of petroleum ether. To the resulting emulsion 25 cc. of alcohol is added, shaken, and the upper layer of fluid drawn off. The shaking-out process with petroleum ether and alcohol is then repeated, the entire contents of the separating funnel poured into the receptacle containing the first extraction, and the whole made up to a bulk of 200 cc. with a mixture consisting of 5 parts of petroleum ether and 2½ parts of 96 per cent alcohol. The mixture is shaken for a second or so, 50 cc. (=12.5 cc. of juice) pipetted off, shaken with a few grams of anhydrous sodium sulphate, allowed to stand stoppered for 2 hours, filtered into 50 cc. of decinormal alkali solution, and washed with petroleum ether-alcohol. After combining the washings and extract the petroleum ether is evaporated and titrated back with tenth-normal acid.

Progress made in the field of milk chemistry and dairying in the second half of 1911, W. GRIMMER (*Milchw. Zentbl., 41 (1912), No. 4, pp. 105–114*).—This is a retrospect of the work accomplished in the field of milk chemistry and in the dairy industry during the second half of the year 1911.

Coagulation of milk by animal and vegetable proteolytic ferments in the presence of hydrogen peroxid, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 20, pp. 881–884*).—A study of the retarding action of hydrogen peroxid on various ferments, mostly vegetable.

A new method for determining whether water has been added to milk, E. COMANDUCCI and F. FRONTERA (*Rend. Soc. Chim. Ital., 2. ser., 4 (1912), No. 5, pp. 125–127*).—The method proposed is as follows: Add 1 cc. of a 50 per cent

[a] Jour. Amer. Chem. Soc., 33 (1911), No. 12, pp. 1947–1952.

solution of trichloracetic acid to 25 cc. of the milk under examination, shake, heat to 70° C., filter until clear, cool the filtrate to 15°, and polarize in a 10 cm. tube with the Laurent polariscope and a yellow light at a distance of 10 cm. The results obtained are compared with those given by normal milks.

In regard to the value of the guaiac reaction for determining whether milk has been properly pasteurized or not, H. WEIGMANN (*Milchw. Zentbl., 41 (1912), No. 2, pp. 33–39*).—The experiments show that as a rule old milk produces a positive reaction with freshly prepared guaiac tincture less readily than recently drawn milk. A good, normal, unheated milk will give a reaction with a sensitive guaiac tincture, but not with all tinctures. The use of certain acetones instead of alcohol as a solvent by the guaiac resin or wood produces a better reagent, but requires a longer time for its preparation. A more sensitive and rapid reagent is also obtained when guaiacol is included in the guaiac tincture (Schern). The reacting enzym is totally destroyed when the milk is heated at 72° for 30 minutes.

Barn dust (from feed) when present in comparatively large amounts (0.8 gm. to 1 gm. per liter) will give a positive reaction and leads one to suspect that raw milk is present. It is, however, hardly to be expected that a milk can take up so large a quantity of dust in its passage over the cooler, and accordingly a reaction from this source is not altogether probable. The addition of 20 per cent or more of water does not cause a positive reaction with heated milk. See also the work of Tewes (E. S. R., 27, p. 13).

Note on the composition and analysis of desiccated milk and cream, R. S. FLEMING (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 543, 544*).—A description of methods for determining moisture, cane sugar, casein, ash, and fat.

A new method for determining fat in these products was worked out by the author which is given in the abstract below. The Adams and Babcock methods and extraction with water-free ether or chloroform were unsatisfactory. The composition of milk powders was found to vary considerably. A cream powder has been recently placed upon the market which contains almost as much fat as butter.

A modification of the Babcock test as applied to the estimation of fat in desiccated milk, N. G. REDMOND (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, p. 544*).—The Babcock test in its usual form can not be used for determining the fat content of dried milk products, but if modified as below it will yield satisfactory results.

"Weigh 2.5 gm. of milk powder and transfer it to an ordinary Babcock milk bottle, graduated to 10 per cent. A glass funnel (about 2 in. in diameter and with the stem cut off to ½ in.) is inserted in the neck of the bottle and is of great help in transferring the powder. Add 31 cc. of dilute sulphuric acid (395 cc. concentrated H_2SO_4 diluted to 1 liter) and place the bottle upright in a dish of gently boiling water. Shake frequently and keep in the boiling water until all the powder is dissolved and the solution is dark brown in color. This usually takes from 7 to 10 minutes. After removing the bottle from the water add 12 cc. concentrated H_2SO_4 (specific gravity 1.82–1.83) and mix thoroughly, taking care to keep the solution out of the neck of the bottle. Agitate with a rotary motion. Place the bottle in a centrifuge and whirl for 4 or 5 minutes. Add hot water until the solution reaches the lower end of the neck, whirl again for 1 minute, then add hot water until the fat rises. Whirl again for 1 minute. In order to secure accurate results, the fat column must be read at a temperature not above 140° F. nor below 130°; by setting the bottle in water the desired temperature may be reached. Readings should be made to 0.05 on the bottle. The reading multiplied by 7.2 gives the percentage of fat."

As Babcock bottles vary in volume it is best to use bottles which hold 45 cc. of water when filled to the lower end of the neck.

The determination of fat in buttermilk by the acid butyrometric method, C. BEGER (*Milchw. Zentbl., 41 (1912), No. 2, pp. 39, 40*).—Apropos of what has been pointed out by Siegfeld and Kersten (E. S. R., 26, p. 410) in regard to the formation of plugs when determining fat in buttermilk by Gerber's method, the author points out that the addition of 1 drop of formaldehyde after adding the milk and sulphuric acid, and amyl alcohol, obviates this disturbance.

Contribution to the chemistry of Cheddar cheese, M. NIERENSTEIN (*Jour. Agr. Sci., 4 (1912), No. 3, pp. 225–244*).—This is a study of the chemical changes produced during the process of cheese ripening by the joint action of bacteria, fungi, etc.

The products isolated consisted of intermediate digestion products, amino acids, and secondary products formed from amino acids. Caseoglutin was extracted from Cheddar cheese with boiling alcohol, and the hydrolytic values obtained therefrom are given and compared with those resulting from the hydrolysis of the caseoglutin isolated from Emmenthal cheese by other authors. Through an oversight tyroalbumin was not isolated. Tyrocasein was noted in the residue left after the cheese body was deprived of other albumins, amino acids, and secondary products. Its product of hydrolysis corresponded closely to those found by Biseggar for the tyrocasein of Emmenthal cheese.

As regards amino acids, the following were isolated from a 4-year-old cheese: Alanin 0.31, valin 0.17, leucin 0.12, isoleucin 0.32, phenylalanin present, tyrosin 3.8, serin present, glutamic acid about 7, tryptophan present, lysin 0.85, aminobutyric acid 0.43, and amino-valeric acid 0.14 per cent. This shows that practically all the amino acids which occur as a result of hydrolyzing casein, with the exception of arginin and aspartic acid, are met with the cheese as free proteolytic products. Valin, leucin, isoleucin, and amino-valeric acid are proven to be present for the first time in Cheddar cheese. Glycin (0.04 per cent) which has not been definitely reported by others as a proteolytic product of casein was present also. The source of glycin may possibly be in lactalbumin, lactglobulin or opalescin. No. 2:5 diketopiperazins or the polypeptids *l*-phenylalanyl-δ-alanyl-anhydrid and leucylvalyl-anhydrid were detected. The amino-valeric acid, which is found in an ethereal extract of the cheese, is, according to the author, probably a mixture of α-amino-valeric acid and δ amino-valeric acid (melting point 157 to 158° C.), and the latter is a secondary product resulting from the putrefaction of ornithin. Putrescin, cadaverin, and perhaps diamin (Brieger) were also isolated from an English Cheddar cheese.

Determination of citral and citronellal in essential oils, C. KLEBER (*Amer. Perfumer, 6 (1912), No. 12, pp. 284, 285; abs. in Ztschr. Angew. Chem., 25 (1912), No. 22, p. 1148*).—A method is proposed which depends upon the fact that phenyl-hydrazin can be titrated with strong acids when using diethyl orange as an indicator, whereas the aldehyde and ketone hydrazins found in the process have a natural reaction.

Soy bean oil for paint purposes, M. TOCH (*Jour. Soc. Chem. Indus., 31 (1912), No. 12, pp. 572–574*).—This is a statement in regard to the possibility of utilizing soy bean oil instead of linseed oil for the manufacture of paint.

The "graisse" sickness of cider, E. KAYSER (*Ann. Inst. Nat. Agron., 2. ser., 11 (1912), No. 1, pp. 77–141, figs. 12*).—This is a detailed report of work previously noted (E. S. R., 26, p. 512), and contains all the analytical and biological data pertaining to the investigation.

Industrial utilization of corn stalks, H. BLIN (*Nature [Paris], 39 (1911), No. 1999, Sup., p. 125; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 8–10, pp. 2313, 2314*).—This is a discussion

of the use of maize stalks for lining the hulls of ships and especially with the cobs, etc., for gas making in the United States.

Fermentation of tobacco, J. C. C. VRIENS and S. TIJMSTRA (*Meded. Deli-Proefstat. Medan, 6 (1912), No. 9, pp. 301–327*).—This is a critical discussion regarding the bacteriological, enzym, and chemical theories of tobacco curing.

METEOROLOGY—WATER.

Methods for the study of agricultural meteorology, V. O. ASKINAZI (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 1922–1926*).—A plan for correlating weather conditions with the stages of development of plants is discussed, and it is maintained that it is necessary to conduct such parallel meteorological and phenological observations in order to establish the relation between crop growth and the course of the weather.

Attention is called to the fact that Brounov in his forms for recording observations at agricultural meteorological stations in Russia distinguishes the following periods for winter and spring cereals:

"For winter cereals (oats, wheat, rye, etc.): Period 1, from the day of sowing until the appearance of the seedlings; period 2, from the day of appearance of the seedling until the day on which snow remains as a permanent covering on the plat; period 3, from the day on which snow remains as a permanent covering on the plat until the moment of melting of the snow; period 4, from the melting of the snow until the moment of earing, when the ear of the panicle emerges from the leaf sheath; period 5, from the moment of earing until the beginning of milky ripeness, the field still green; period 6, from the day of milky ripeness until the time of complete ripeness.

"For spring cereals: Period 1, from the day of sowing until the appearance of the seedlings; period 2, from the appearance of the seedlings until the moment of earing; period 3, from the day of appearance of the phases of earing until the appearance of yellow (cheesy) ripeness, the stage in which the caryopses are yellow, as soft as wax, and are easily crushed between the fingers."

Air and water, G. BLEUEL (*Jahresber. Agr. Chem., 3. ser., 14 (1911), pp. 3–50*).—This is a review of recent scientific literature on these subjects similar to those of previous years.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and H. W. ANGIER (*Massachusetts Sta. Met. Buls. 285–286, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1912. The data are briefly discussed in general notes on the weather of each month.

Meteorological records for 1911 (*New York State Sta. Rpt. 1911, pp. 333–344*).—Tables are given showing daily readings at Geneva, N. Y., of maximum and minimum thermometers at 5 p. m. for each month of the year; tridaily readings of standard air thermometers for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings; monthly and yearly maximum and minimum temperatures from 1883 to 1911, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

Meteorology, H. D. EDMISTON (*Pennsylvania Sta. Rpt. 1911, pp. 387–398, 621–642*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 25, p. 811). The summary for 1910 is as follows:

Summary of meteorological observations, 1910.

	1910	Growing season (April–September).
Barometer (inches): Mean	30.018	
Temperature (°F.):		
Mean	48.5	61.6.
Highest	91.0 (July 24)	91.0 (July 24).
Lowest	−5.0 (Feb. 7)	30.0 (Apr. 8, 13).
Greatest daily range	43.0 (Mar. 28)	40.0 (Apr. 14).
Least daily range	4.0 (Jan. 6, 8)	
Rainfall (inches)	44.58	26.55.
Number of days on which 0.01 in. or more rain fell	140	68.
Mean percentage of cloudiness	56.3	72.5.
Number of days on which cloudiness averaged 80 per cent or more.	102	46.
Last frost in spring		May 16.
First frost in fall		Aug. 27.

Seventh annual report of the meteorological committee (*Ann. Rpt. Met. Com.* [*Gt. Brit.*], *7 (1912), pp. 173, pls. 4, figs. 2*).—This consists of administrative reports regarding the organization and operations (during the year ended March 31, 1912) of the marine, forecasts and storm warnings, statistics and library, and instruments divisions, and brief reports of the central, magnetic, western, aerological, and Aberdeen observatories, with appendixes as follows: Financial statement, supply of information to the public, lists of observers who sent in "excellent" meteorological logs during the year and of logs and documents received from ships, distribution of instruments, report on inspection of meteorological stations, and lists of persons and institutions from whom publications and meteorological data have been received and to whom publications are sent.

An improvement in the success of forecasts is reported.

The relation of the soil to meteorological factors, I and II, E. Loske (*Trudy Selsk. Khoz. Met., 1911, No. 8, pp. XII+104*).—This article constitutes part 1 of a report on work in Russia on agricultural meteorology and related questions.

Observations on the temperature relationships of the air above the soil and of the soil at different depths, B. Schulze and H. Burmester (*Internat. Mitt. Bodenk., 2 (1912), No. 2–3, pp. 133–148*).—Continuing previous work (E. S. R., 20, p. 713), the authors report comparative observations on the temperature of the air (1) at a height of 1½ meters, and (2) immediately above the soil and under the vegetation, and of the soil at different depths to 130 cm. The general results were in agreement with those of the preliminary report.

Surface water supply of St. Lawrence River basin, 1910, C. C. Covert, A. H. Horton, and R. H. Bolster (*U. S. Geol. Survey, Water-Supply Paper 284, pp. 125, pls. 2*).—This paper contains a description of the St. Lawrence River basin and the results of stream measurements in it, namely, gage-height records, results of current-meter measurements, and daily and monthly discharges

Surface water supply of Colorado River basin, 1910, W. B. Freeman, E. C. La Rue, and H. D. Padgett (*U. S. Geol. Survey, Water-Supply Paper 289, pp. 233, pls. 4*).—This report contains a description of the drainage basin named and a detailed report of the results of stream measurements in it.

Surface water supply of the Great Basin, 1910, E. C. La Rue, F. F. Henshaw, and E. A. Porter (*U. S. Geol. Survey, Water-Supply Paper 290, pp. 264, pls. 3*).—The Great Basin is described and the results of stream measurements in it are reported in detail.

Surface water supply of Pacific coast in California, 1910, W. B. Clapp, F. F. Henshaw, and H. D. McGlashan (*U. S. Geol. Survey, Water-Supply*

Paper 291, pp. 218, pls. 4, fig. 1).—This report contains a description of the drainage basin named and a detailed report of the results of stream measurements in it.

An intensive study of the water resources of a part of Owens Valley, California, C. H. LEE (*U. S. Geol. Survey, Water-Supply Paper 294, pp. 135, pls. 30, figs. 8*).—This paper "presents the results of studies made by the Department of Public Works, Bureau of the Los Angeles Aqueduct, City of Los Angeles, in cooperation with the United States Geological Survey and the State of California, for the purpose of determining the available underground water supply of Owens Valley. The city of Los Angeles plans to develop a municipal water supply from the surplus surface waters reaching the lower end of the valley and from the underground sources, which have so far remained untouched. Investigations were made especially in the Independence region, an isolated portion of the valley. The data obtained are discussed under the following heads: Physical features of the region, precipitation, stream flow, evaporation and transpiration, percolation, and ground water. The book contains numerous tables showing precipitation and depth of evaporation, in inches, at certain stations, and monthly and seasonal discharges of streams tributary to the region, as well as maps and half-tone plates illustrating drainage features."

Gazetteer of surface waters in San Joaquin River basin, California, B. D. WOOD (*U. S. Geol. Survey, Water-Supply Paper 296, pp. 102*).—This is "the second of a series of reports on the surface waters of California, prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission and the State Board of Control (Water Powers). Every stream and gaging station in the San Joaquin River basin is listed in this paper."

Water resources of California.—I, Stream measurements in Sacramento River basin, H. D. MCGLASHAN and F. F. HENSHAW (*U. S. Geol. Survey, Water Supply Paper 298, pp. 411, pls. 8, figs. 3*).—This is "one of a series of six reports on the surface waters of California prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission and the State Water Commission. This paper describes the streams that have been measured in the Sacramento River basin and the stations at which the work has been carried on and gives tables covering all the measurements and estimates made by the Geological Survey in this basin. The investigations of the flow of water in the streams have been supplemented by studies of the climatic and other factors affecting stream flow."

SOILS—FERTILIZERS.

A study of the soils of the United States, G. N. COFFEY (*U. S. Dept. Agr., Bur. Soils Bul. 85, pp. 114, pls. 1, fig. 1*).—This is a thesis submitted for the degree of doctor of philosophy at the George Washington University in which the author gives a classification and description, including soil map, of the soils of the United States based upon the accumulated information published in the detailed field reports of the Bureau of Soils.

The work emphasizes the difficulties which attend the correlation and classification of the soils of the United States, and seems to indicate that this can be accomplished with scientific accuracy only after much more extended study of the characteristics of the soil types and series with regard also to the origin and process of formation.

An extensive bibliography is appended.

A report on soil temperature, B. E. Brown and W. H. McIntire (*Pennsylvania Sta. Rpt. 1911, pp. 129–140*).—Periodic temperature determinations from May 16 to November 28 in soils of the general fertilizer plats cropped to oats are reported.

The highest average soil temperatures were in the low yielding plats. It is stated, however, that the high yielding plats contained more moisture than the low yielding plats, a factor which would tend to influence the temperature of the soils. In one instance a difference of 8° in soil temperature was recorded, the variation in moisture content being about 2 per cent. "Later on in the season this difference in temperature was overcome, yet the differenc in moisture content was practically the same."

Studies in soil catalysis, M. X. Sullivan and F. R. Reid (*U. S. Dept. Agr., Bur. Soils Bul. 86, pp. 31, pls. 2*).—The authors review investigations by others on this subject and, in continuation of their work on soil oxidation (E. S. R., 24, p. 223), report studies of the nature of soil catalysis and its correlation with soil conditions and different soil types. In the experiments 5 gm. of air-dried soil were treated with about 10 cc. of approximately 1½ per cent hydrogen peroxid solution and the oxygen given off was determined, taking the time required to evolve 50 cc. of oxygen as the criterion for the catalytic power of the soil.

Tests thus carried out on different soil types showed that "soils which gave the greater decomposition of the hydrogen peroxid were soils which were known to be of good productivity, while the poor soils had, as a rule, poorer catalytic power. The catalytic power and productivity, however, do not necessarily agree, since there are soils of slight catalytic power which give good crop growth. . . . This power is greater in soil than in subsoils, in strong vital soils than in weak soils. It persists for years in air-dried soils."

"The power of oxidizing easily oxidizable substances and the power to decompose hydrogen peroxid do not necessarily go hand in hand, since the addition of citric acid to certain soils increases the oxidative power while greatly descreasing the catalytic power. Again, the oxidizing power may be lost while the catalyzing power is still present, though weakened."

Different fertilizers had different effects on the catalytic power of soils. The limed soils had a slightly quicker rate of catalysis. An increase in moisture content of the soil decreased rather than increased the catalytic power, indicating that the power is not due to a soluble catalase.

There was very little relation between the Fe_2O_3 content and the catalytic power of the soil, but a close relation between the manganese content, estimated as MnO, and the catalytic power. The form of the manganese rather than the absolute amount, or the nature of the associated organic matter, was the determining factor, as was shown by the fact that a soil with a small manganese content was a much better catalyzer than another soil with two and one-half times as much MnO and by the further fact that the addition of manganese salts had no effect in increasing the catalytic power of soils.

Tests of the effect of various poisons showed that the catalytic power was checked "to some degree by carbon bisulphid, mercuric chlorid, and especially by hydrocyanic acid, which in some cases practically destroys it. Heating in an autoclave under pressure of 10 atmospheres retards the catalytic power, though dry heat for 1 hour at 105° has little depressing action. Various inorganic substances and several organic compounds, especially those in a state of partial oxidation, have the power of decomposing hydrogen peroxid, while several organic compounds increase the catalytic power of manganese dioxid. In general, the catalytic power of soils seems to be due not to an enzym, such

as catalase, but rather to the inorganic and organic matter working separately, conjointly, or in activating combination."

Are humus acids or colloids present in humus substances? H. NIKLAS (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 7, pp. 379–389*).—This is a review of investigations on this subject by Baumann and Gully (E. S. R., 23, p. 715), A. Rindell (E. S. R., 26, p. 123), B. Tacke and H. Süchting (E. S. R., 26, p. 720), and S. Odén (E. S. R., 27, p. 322).

Investigations on "sickness" in soil.—I, Sewage sickness, E. J. RUSSELL and J. GOLDING (*Jour. Agr. Sci., 5 (1912), No. 1, pp. 27–47; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 21, p. 1045*).—A study of conditions on a sewage farm which had ceased properly to purify sewage applied to it is reported and discussed in this article. The general conclusions reached were as follows:

"Two distinct sets of causes can be traced at work in sewage-sick soils, physical causes that lead to retarded percolation and a factor detrimental to bacteria.

"The factor detrimental to bacteria is in every respect similar to that shown by Russell and Hutchinson to exist in ordinary soils. It is put out of action by the same antiseptics and by heat; it is not bacterial nor is it any bacterial product; it is not carried by an aqueous extract of the soil. On the other hand it is transmitted to partially sterilized soils by inoculation with untreated soil. It is not put out of action by aeration or by liming.

"Its effects are, however, much more pronounced in sewage-sick soil than in ordinary soil. While the bacteria in the untreated sick soil only rarely rise to 40 millions per gram they may rise to as many as 400 millions per gram in the partially sterilized soils. The high amounts of moisture and organic matter in the sewage-sick soil appear to be especially favorable to the harmful factor.

"Sewage sickness is thus regarded, in part, as an abnormal development of the harmful factor always present in ordinary soils.

"As in the case of ordinary soils, all the properties of the harmful factor indicate that it is biological and consists of organisms larger than bacteria. Examination of the untreated soil showed the presence of numbers of amebæ and other protozoa, some of which could be separated out in an active form by centrifuging. None were present in the partially sterilized soil. All the evidence at present available points to these as constituting the harmful factor.

"After the harmful factor is killed by partial sterilization the bacteria multiply rapidly and rise to high numbers, effecting more decomposition of the added sewage so that a purer effluent is obtained. No complicating factors appear to be introduced when the method is tried on the large scale, and there can be little doubt that once the practical difficulties of partially sterilizing large quantities of soil are overcome it will find useful application in sewage-farm practice wherever the rate of decomposition is limited by the numbers of bacteria."

Investigations on "sickness" in soil.—II, "Sickness" in glasshouse soils, E. J. RUSSELL and F. R. PETHERBRIDGE (*Jour. Agr. Sci., 5 (1912), No. 1, pp. 86–111, pls. 4; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 21, p. 1045*).—From the investigations here reported the authors conclude that "sickness in glasshouse soils is conditioned by at least two factors, (a) an accumulation of insect and fungoid pests, (b) a lowered bacterial efficiency. The lowering of the bacterial efficiency is due to the accumulation of a factor detrimental to bacteria.

"The sick soils examined did not appear to contain any substance toxic to plants or bacteria. The soils were well supplied with plant food and with calcium carbonate.

"The factor detrimental to bacteria resembles in every way that present in ordinary arable soil. It is put out of action by heat or by antiseptics. It is

not associated with the bacteria but with the soil, and is capable of growth when introduced into partially sterilized soil. In all respects its properties agree with those of protozoa.

"There is no evidence that sickness is due to an accumulation of bacteria acting unfavorably on the production of plant food (e. g., denitrifying bacteria) or that the beneficial effect of partial sterilization is due to the destruction of such bacteria. So far as we can find, all bacterial actions are accelerated in partially sterilized soils; there is, for example, a marked increase in the rate of loss of nitrogen.

"Soil sickness in tomato and cucumber houses can be effectually treated by partial sterilization."

Of the methods tested, heating to 90 to 100° C. proved best, but is more expensive than treatment with antiseptics. The latter method, however, has not been fully worked out.

Bacteriological studies of field soils.—II, The effects of continuous cropping and various rotations, P. E. Brown (*Iowa Sta. Research Bul. 6, pp. 213–246*).—The author reviews briefly investigations by others, and in continuation of previous work (E. S. R., 27, p. 720) reports a study of the effect of continuous cropping as compared with different crop rotations on the total number of bacteria and on the ammonifying, nitrifying, and nitrogen-fixing powers of soils. The relation of crop yields to the bacterial activities of the soil, as brought out in these experiments, is also briefly discussed. The following conclusions are drawn:

"The rotation of crops caused the development of greater numbers of organisms in the soil and of greater ammonifying, nitrifying, and nitrogen-fixing power by the soil, than continuous cropping either to corn or to clover.

"Greater numbers of organisms, greater ammonifying, nitrifying, and nitrogen-fixing powers were found in a soil under a 3-year rotation of corn, oats, and clover, than in a soil under a 2-year rotation of corn and oats, or in a soil under a 2-year rotation with clover, cowpeas, or oats, turned under as green manure.

"The use of a green manure in a 2-year rotation did not always increase the number of bacteria or the ammonifying, nitrifying, or nitrogen-fixing power of the soil, and it is suggested that the explanation may be sought in the moisture factor or it may be found in the introduction of such large amounts of organic matter.

"There was an indication that the crop present on the soil was of more importance from the bacterial standpoint than the previous cropping of the soil.

"The ammonification of dried blood and of cotton-seed meal did not always run parallel.

"The nitrification of dried blood and of ammonium sulphate proceeded almost parallel.

"Nitrification and ammonification proceeded in the same direction."

The bacterial activities and crop production of the soils were very closely related; the results "lend support to the theory that soil treatment which increases bacterial activities in the soil should increase the crop-producing power of the soil."

Bacteriological studies of field soils.—II, The effects of continuous cropping and various rotations, P. E. Brown (*Centbl. Bakt. [etc.], 2. Abt., 53 (1912), No. 11–13, pp. 248–272*).—This is an abridged account of the above investigations.

Relation of the total nitrogen of the soil to its needs as shown in pot experiments, G. S. Fraps (*Texas Sta. Bul. 151, pp. 3–15, figs. 4*).—Continuing

previous work (E. S. R., 20, p. 424), the author reports the results of studies of the relation of the growth, weight, and nitrogen content of crops to the total nitrogen of the soil. The method of conducting the 332 pot experiments was substantially the same as that employed in studies of the active phosphoric acid and the active potash of the soil (E. S. R., 27, p. 323).

Summarizing the results of this work, the author concludes that "there is a relation between the number of crops deficient in nitrogen in pot experiments and the total nitrogen of the soil.

"The weight of the crops increases with the nitrogen content of the soil up to 0.06 per cent, and remains nearly the same for the groups of soils containing 0.06 to 0.18 per cent nitrogen.

"The effect of fertilizer nitrogen in the pot experiments decreases as the percentage of nitrogen in the soil increases.

"The average nitrogen content of the crops increases as the nitrogen content of the soil increases, but a larger number of crops should be studied with respect to this point.

"The average nitrogen withdrawn by the crops in the pot experiments, expressed as bushels of corn per acre, increases from 8 bu. for soils containing less than 0.02 per cent nitrogen, to 56 bu. for soils containing 0.16 to 0.18 per cent nitrogen.

"It is difficult to establish percentages below which a soil is 'deficient' and above which it is not, but the possibility of production can be related to the quantity of plant food in the soil, and other factors of production."

Bacteriology of the general fertilizer plats.—I, Effect of partial sterilization upon nitrification, G. C. GIVEN (*Pennsylvania Sta. Rpt. 1911, pp. 384–387*).—Nitrification was twice as rapid in soil which had been sterilized in an autoclave and then reinoculated as in soil which had not been sterilized.

Acid and steam digestion of soils.—A study of their effect upon ammonia production and nitrogen solubility, B. E. BROWN (*Pennsylvania Sta. Rpt. 1911, pp. 147–162*).—This is a continuation of previous work (E. S. R., 25, p. 820), and reports studies of the effect of acid and of steam digestion upon ammonia production and the total soluble nitrogen in soils of the long-time general fertilizer plats of the station receiving dried blood, sodium nitrate, and ammonium sulphate. Tests of the oxidation and catalytic power of the soil of these plats are also reported.

It was found that "the dried blood plats contained the greatest amount of total nitrogen and ammoniacal nitrogen, but were not as well supplied with nitrates at the time as the sodium nitrate treated plats. The three sodium nitrate treated plats contained more nitrogen than the ammonium sulphate plats, although the average difference was not very great. . . .

"The effect of digesting the soils with hydrochloric acid (1.115 sp. gr.) upon the nitrogenous compounds was marked, in that about three-fourths of the total nitrogen went into solution. The amounts dissolved, with the exception of the sodium nitrate treated plats, took the same order as the total nitrogen results.

"There were more marked variations in the amount dissolved from the nitrate of soda and sulphate of ammonia plats than the dried blood plats. The amount of ammonia nitrogen formed by the action of the acid on the different soils varied considerably. It was least in the case of the untreated plat. . . .

"Steam digestion in the soils in a high pressure autoclave at 6 and 10 atmospheres, respectively, showed:

"(1) An increase in the production of ammonia nitrogen, and in the amount of total nitrogen going into solution with the increase in pressure.

"(2) The amount of nitrogen which went into solution was least in the case of the untreated plat, both at 6 and 10 atmospheres, respectively. At 6 atmos-

pheres pressure the above relation held for ammonia nitrogen, but at 10 atmospheres more ammonia was formed by the action of the acid on the untreated soil than on some of the other plat soils.

"(3) If the actual amounts of ammonia nitrogen are considered, it is evident that more was produced, per unit weight of soil, from the dried blood plats. The above statement also applies to the total nitrogen results. . . . On the other hand, if considered on the basis of the nitrogen itself, which varies in quantity per unit weight of soil, the above relation is somewhat changed.

"The amount of material rendered soluble at 6 and 10 atmospheres, respectively, increased with the increase in pressure.

"The amount dissolved from the untreated soil ran lower than any of the treated plats. The greatest amount was dissolved from the dried blood plat; next from the ammonium sulphate plats; and, last of all, from the sodium nitrate plats.

"The oxidative power of the plat soils, as measured by their action on aloin, indicated that the untreated plat and the ammonium sulphate treated plats possessed a lower oxidative power than either the dried blood or the sodium nitrate plats. It was shown that, on an average basis, the dried blood plats oxidized the aloin more rapidly than the sodium nitrate treated plats."

The hydrogen peroxid decomposing power of the ammonium sulphate plats was markedly depressed, which was thought to be due quite likely to the greater acidity of the soil of these plats.

Periodical lime-requirement determinations on four plats receiving sulphate of ammonia, B. E. Brown (*Pennsylvania Sta. Rpt. 1911, pp. 143–147*).—The results showed clearly the need of lime, but that it varies from season to season and perhaps with the crop and cultural operations.

The lime requirement of the general fertilizer plats as determined periodically, F. D. Gardner and B. E. Brown (*Pennsylvania Sta. Rpt. 1911, pp. 25–60, pl. 1*).—The lime requirements of differently fertilized plats in the general fertilizer experiments which have been carried on since 1881–82 were studied by means of the Veitch method.

"Notwithstanding certain marked variations, it was generally found that the results were fairly consistent and seemed to indicate seasonal variations in lime requirement. . . .

"Of the plats which received nitrogen in different forms and quantities, the nitrate of soda plats, when the results are expressed as a general average for all tiers, required the least amount of lime, the dried blood plats were next, and the sulphate of ammonia plats required the greatest amount. The average requirement for the plats which received 24, 48, and 72 lbs. of nitrogen per acre in nitrate of soda was 432 lbs. of CaO per acre, the dried blood plats (6 in all) 450 lbs., and the sulphate of ammonia plats 1,507 lbs. . . .

"The plats which received manure at the rate of 6, 8, and 10 tons, respectively, per acre, failed to show a consistent relation between treatment and lime requirement.

"The most salient point of the work was the fact of finding out that the high-yielding plats possessed a higher average lime requirement than the low-yielding plats, which merely serves to emphasize the point that no one factor in soil fertility is all-important. Nor can it be said, judging by the present results, that the plats, excepting the sulphate of ammonia plats, need lime as badly as was thought."

The effect of fertilizers and certain other substances upon soil untreated for twenty-nine years, B. E. Brown (*Pennsylvania Sta. Rpt. 1911, pp. 140–143, pls. 3*).—Wire-basket tests of soils which had been continuously cropped without manure for 29 years showed that of the single elements, nitrogen gave

the best results, and that of combinations of two elements, nitrogen and phosphoric acid was most effective. "Organic materials, when supplemented with fertilizer salts, produced a great increase in yield.

"With the exception of the sugar treatment, the other treatments considered unusual gave yields greater than the untreated set. . . . Both the potassium bichromate and potassium permanganate were more effective than potassium sulphate, no doubt indicating other effects than that due to the potassium alone."

While lime proved beneficial, the addition of free acids was also beneficial. "Hydrogen dioxid, pyrogallol, and steaming were also effective means of producing increased yields."

The general composition of the grass lands contiguous to the general fertilizer plats, W. FREAR and J. W. WHITE (*Pennsylvania Sta. Rpt. 1911, pp. 313–349*).—In continuation of earlier work (E. S. R., 25, p. 821), comparative tests were made of methods of determining and studying the composition of humus, and of phosphoric acid and sulphur compounds in samples of soil from the roadways surrounding and dividing the general fertilizer plats.

It was found that "the 'humus ash', held in the ammoniacal filtrate from this soil by the official method, consists almost exclusively of silica and iron and aluminum oxids, present probably in suspension in that filtrate, and in an unknown condition of hydration."

The organic matter of the ammoniacal filtrate carried with it, in case of the official method, 39.62 per cent, and in case of the tube method, 50.46 per cent of the associated mineral materials.

The soils were distinctly acid. The quantities of free humus acids in the soil, that is, the organic matter directly soluble in weak ammonia without preliminary extraction with an acid, ranged from 8 to 16 mg. per gram of air-dried soil. "Moreover, the quantities of this free acid vary exactly with the lime requirements shown by the Veitch method, 11.27 lbs. of this free acid requiring 1 lb. of lime for its neutralization."

On the basis of the results obtained, the organic matter of these grass lands is divided into inactive humus, 55.71 per cent; active humus, 44.29 per cent (free, 34.36 per cent; combined, 9.93 per cent). The inactive humus of the soil contained 2.8 per cent nitrogen; of the subsoil, 1.29 per cent. The active humus of the soil contained 5.83 per cent of nitrogen; of the subsoil, 6.28 per cent. Of the total nitrogen of the soil 37.7 per cent was in the inactive humus, but only 15.2 per cent of that of the subsoil.

Present methods for estimating organic phosphorus in soils were found to give very discordant results. "In fact, none of them possess a logical basis." Schmoeger's method is considered the best in theory.

It was found that, when the soil was ignited, the official method obtained only 90 per cent of the sulphur shown by the Hilgard method. "The sulphur expressed as sulphuric anhydrid (SO_3), dissolved by 12 per cent hydrochloric acid from ignited soil more than from unignited soil, was 0.0289 per cent; present in the inactive humus 0.0475 per cent, and in the precipitate therefrom 0.0335 per cent. The quantity soluble upon acidulating the alkaline extract was only two-sevenths of the total in the active humus." The results were not conclusive as to the forms of the sulphur.

A bibliography of the literature is added.

An investigation of the causes of variation in soil fertility as affected by long-continued use of different fertilizers, B. E. BROWN and W. H. MCINTIRE (*Pennsylvania Sta. Rpt. 1911, pp. 113–129*).—The studies here reported were made on soil of 8 plats which had been used in fertilizer experiments for 29 years and had shown marked differences in yields of corn, oats, wheat, and hay.

As a rule large amounts of matter were dissolved by water and alcohol from the high-yielding plats. The latter also had a larger water content. The oxidizing power of wheat plants was greatest in extracts of the high-yielding soils. "CaO and P_2O_5 results were obtained by analyzing acid extracts of the different plats. The P_2O_5 content of the different plats was interesting in that the differences can be associated with the differences in yield. It was also found that the nitrogen content of the 8 plats took the same order of differences as shown by the yields of combined oats grain and straw."

The relation of certain water-soluble soil constituents in plats 16 to 24, B. E. Brown and W. H. McIntire (*Pennsylvania Sta. Rpt. 1911, pp. 102–113, pls. 3*).—Continuing previous work (E. S. R., 25, p. 820), the authors report periodic determinations of nitrates, potassium, calcium, and total salts in plats treated with different amounts of manure, dried blood in combination with minerals, lime and manure, and lime alone. Determinations of soil moisture, total carbon, and nitrogen were also made.

The results indicated that the smallest application of manure (6 tons per acre) and of dried blood (24 lbs. of nitrogen) gave as good results as larger applications. The effect of increasing the quantity of manure and dried blood was more favorable to the wheat than the oats, corn, or hay. The yields of the plat receiving lime alone and the untreated plat ran considerably lower than those of the other plats. The untreated plat and the plat receiving lime alone contained less moisture than the other plats. "There seems to have been a fairly well defined correlation between organic matter content and the moisture content. The manure plats were better supplied with nitrates than the plats which received commercial fertilizers. The [plat receiving] lime alone contained less nitrates than the untreated plat."

Extracts from the plat receiving lime alone contained more potassium than those of the manure plats. The amount of potassium recoverable from the manure plats decreased as the manure applications increased. The lime plat always ran highest in total salts as well as in volatile and nonvolatile matter. The total salts became less as the amount of manure was increased.

The results for the plat receiving "lime alone and the untreated plat, in almost every instance, can be correlated with their low yielding capacity. In general, the effect of adding manure, while not producing much larger yields than the commercial fertilizer, seems to have been more beneficial to the soil than the treatment with commercial fertilizers."

Various experiments with fertilizers, J. Dumont and J. Aurousseau (*Ann. École Nat. Agr. Grignon, 2 (1911), pp. 77–104*).—This is a series of short papers on the rational use of superphosphates (E. S. R., 21, p. 531), the nitrification of green manures, tests of phosphatic fertilizers on autumn cover crops, nitrifying capacity of humic and nitrogenous fertilizers, influence of humic and peptonized fertilizers on the chemical composition of beets, chemical composition of fermented fertilizers, the distribution and utilization of the active principles of manure, notes on the mineral nutrition of plants (see p. 127), treatment of animal substances, and chemical and biochemical purification of sewage.

It was found that the nitrification of lupines was much more rapid than that of mustard. In comparative tests of ammonium sulphate, dried blood, humic fertilizers, and matière noire, nitrification, in all cases except the humus fertilizers, was dependent upon the presence of calcium compounds capable of mobilizing potash or bringing about chemical transformations producing either carbonates or ammoniacal humates.

The efficiency of various phosphatic fertilizers on autumn cover crops varied with the kind of crop (lupines and mustard).

Peptonized humus fertilizers increased the yield of crops without a proportional increase in their assimilation of mineral matter.

An important result of the fermentation of manure is the increase of matière noire and an enrichment of the latter in nitrogen, phosphoric acid, and potash. The fertilizing value of manure depends upon the amount of matière noire and the distribution of the fertilizing elements between this substance and the insoluble residue of the manure. An application of 10,000 kg. of manure per hectare (about 8,900 lbs. per acre) annually is not deemed sufficient to support good crops.

The conversion of animal substances into active fertilizers by digestion in an autoclave with acid or alkaline solutions and of blood into an odorless, nonputrescible fertilizer by precipitation with phosphoric acid or monocalcium phosphate is briefly described.

A method of purification of sewage based upon the addition of lime water followed by superphosphate is described.

Effect of acidulation upon the availability of inert nitrogenous fertilizer ingredients, W. FREAR, F. P. WEAVER, and W. THOMAS (*Pennsylvania Sta. Rpt. 1911, pp. 349–378*).—It was found in these experiments that the action of the acid treatment on such materials as leather, hair, hoof, horn, wool, peat, and garbage "resulted in the formation of ammonium salts, which represent 10 to 15 per cent of the nitrogen in the acid-mixed goods.

"The nitrogen in the original materials is but slightly soluble in water; after acid action, most of the nitrogen is water-soluble.

"The residues of nitrogen, not ammoniacal nor water-soluble, in the acid-mixed goods are more readily available, judged by their convertibility to a water-soluble state, and also, in some cases, by their convertibility to ammonia by the action of potassium permanganate, the reagent commonly employed to measure approximately the availability of fertilizer nitrogen.

"The acid-mixed materials were converted to ammonia in the soil far more completely than the like materials not treated with acid, and, with the exception of acid-mixed garbage tankage, even more largely than dried blood, the comparison having been made after a period of 7 days.

"At the end of a seven weeks' test, it was found that all the acid-mixed materials, except wool waste, were nitrified in the soil more completely than the corresponding raw materials, and than dried blood, despite the fact that the raw materials were not accompanied, as the acid-mixed materials were, by calcium sulphate, which, under the conditions of this test, was found injurious rather than advantageous to nitrification.

"The vegetation tests, made with fall rye on a soil deficient in available nitrogen, point strongly toward a superior crop-producing power, under our field conditions, for these acid-mixed 'low-grade' nitrogenous substances, not only over the raw materials by whose acid treatment they have been prepared, but also over dried blood."

The use of ground phonolite as a potash fertilizer, F. SCHUCHT (*Landw. Jahrb., 42 (1912), No. 2, pp. 323–328; abs. in Ztschr. Angew. Chem., 25 (1912), No. 40, p. 2086; Chem. Zentbl., 1912, II, No. 5, p. 379*).—This material is considered to have a certain fertilizing value and to promote conditions (alkalinity) favorable to nitrification, but without treatment to render its potash more available it can not compete with soluble salts as a fertilizer.

The rôle of infinitely small amounts of chemicals in agriculture, G. BERTRAND (*Amer. Fert., 37 (1912), No. 8, pp. 37, 38; Rev. Sci. [Paris], 51 (1913), I, No. 3, pp. 65–72*).—This is an address delivered at the Eighth International Congress of Applied Chemistry, dealing mainly with the value of manganese as a

catalytic fertilizer, and citing evidence from experiments by the author to show that a minute amount of manganese may increase crops to a large and profitable extent. The application found to give best results on good soils was generally from 30 to 50 kg. of dry soil per hectare (from 26.7 to 44.5 lbs. per acre).

Report on commercial fertilizers, 1912, E. H. JENKINS and J. P. STREET (*Conn. State Sta. Rpt. 1912, pt. 1, pp. 93*).—This report deals, as usual, with the requirements and observance of the state fertilizer law, the distribution and classification of the fertilizers collected, and explanations regarding analyses and valuations of the fertilizers, and reports analyses and valuations of 780 samples of fertilizers and fertilizing materials examined during the year.

Fertilizer inspection (*Maine Sta. Off. Insp. 42, pp. 117–156*).—Reports of analyses of samples of fertilizers found on sale in Maine in 1912 are published in this circular, together with other pertinent information relating to the inspection, composition, valuation, and use of fertlizers. Attention is called particularly to determinations of different forms of nitrogen by methods agreed upon by directors of stations in the New England States, New York, and New Jersey.

Fertilizer analyses, A. J. PATTEN, W. C. MABTI, and A. ITANO (*Michigan Sta. Bul. 269, pp. 19–67*).—Analyses and valuations of 298 samples, representing 267 brands, of fertilizers collected during the spring of 1912 are reported.

Of these samples 27 (or 9 per cent) were below guaranty in one or more constituents, 10 were below guaranty in nitrogen, 6 in available phosphoric acid, 1 in total phosphoric acid, and 13 in potash. Two were below in nitrogen and potash and 1 in potash and available phosphoric acid. This is considered a very satisfactory showing.

AGRICULTURAL BOTANY.

Investigations on the distribution of temperature in plants, W. LOUGUININE and G. DUPONT (*Rev. Gén. Bot., 24 (1912), No. 282, pp. 244–266, figs. 17*).—By means of a specially devised electrical apparatus, the authors have made a study of the temperature of different parts of the growing plant. They found that in general the temperature increases rapidly in the stem as the distance from the ground is increased, until a region of equilibrium is established, when the temperature again increases toward the extremities. In the leaves the temperature decreases, beginning with the petiole, attains a minimum at its juncture with the blade of the leaf, and again increases rapidly in the veinlets in case of palmately-veined leaves or more slowly in pinnate venation. In buds the temperature is generally higher than in any other part of the plant.

In all cases, according to the authors' explanation, the differences in temperature are due to the circulation of the sap and to chemical phenomena in the plant. If the vapor tension is increased the differences in temperature tend to disappear, except when they are due to chemical reactions.

Under the influence of intense light the differences noted above are more or less reversed. In direct sunlight the maximum temperatures are attained in general in the organs of the plant that are the most thickened. The phenomena of evaporation and circulation of sap are preponderant in the distribution of the temperature.

The effect of colors was studied, and in sunlight red leaves always had a higher temperature than green ones.

The permeability of root tips of Vicia faba, H. LUNDEGÅRDH (*K. Svenska Vetensk. Akad. Handl., 47 (1911), No. 3, pp. 254, pl. 1, figs. 55*).—The author made a long series of investigations on the permeability of root tips of *V. faba* as affected by various influences.

Recovery from plasmolysis is found to depend upon the manner in which the plasmolysis has been produced. Plasmolysis, when effected by very dilute solutions, is usually followed by normal recovery; that due to concentrated solutions, by abnormal dilatation. Dilute acids apparently alter the permeability of the protoplasm. Short exposures to dilute salts exert a specific influence on the permeability for water. Cane sugar, levulose, dextrose, and mannite exert considerably more influence in limiting permeability toward water than do potassium nitrate and glycerin. Chloral hydrate and caffein produce little immediate limitation of permeability; but, like numerous other compounds examined, on longer exposure these exhibit a limiting influence, associated with internal chemical change in the cell and apparently secondary thereto.

Considerable parallelism was noted between the capability of a substance to alter permeability and its poisonous or injurious effect on the cells. Repeated plasmolysis alters permeability. The same effect follows centrifugalization, but the after influence of this treatment is still greater in this respect. Root tips show permeability for various salts in different degrees, being slightly permeable by sodium chlorid, magnesium sulphate, and sodium citrate; readily permeable by ammonium carbonate and sodium acetate; and moderately so by potassium nitrate, potassium chlorid, etc. These effects are held to show that the root tips function as absorption organs for nutritive salts. It is claimed that a certain parallelism exists between permeability for salts and the use of salts by the plant.

The alterations of permeability obtained by long exposure to dilute salt solutions show no very close agreement with those produced by briefer action of the same salts. The first-named effects seemed to depend chiefly upon secondary processes, apparently set up by metabolic changes.

Concerning the mineral nutrition of plants, J. DUMONT (*Ann. École Nat. Agr. Grignon, 2 (1911), pp. 95–99*).—The author discusses some of the more recent theories regarding the mineral nutrition of plants, particularly with reference to the absorption of minerals, and announces the theory which in the main is as follows:

The plasmic membrane of plants is naturally permeable to the dissolved substances. In the organs of absorption and elaboration this membrane is in perpetual conflict with the soluble materials coming from the exterior or contained in the cell sap. This conflict brings about a contraction of the protoplasm and a diminution of the natural permeability, resulting in a semipermeable or at times an impermeable state, depending on the intensity of the conflict between the electrolytes and the colloidal plasma. Semipermeability is simply for the purpose of suspending the passage of dissolved materials without definitely checking the life of the cell. The semipermeable membrane may resume its permeability and bring about an exchange whenever the conflict has become weakened or has disappeared.

Synthetic processes in plants, P. BOYSEN-JENSEN (*Biochem. Ztschr., 40 (1912), No. 5–6, pp. 420–440, figs. 2; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, pp. 672, 673*).—The author's investigations with the contents of sprouting seeds led to the following conclusions:

Oxygen access is an indispensable condition for the formation of cane sugar, as is evidenced by the fact, among others, that sugar concentration decreased in an atmosphere of hydrogen and increased on admission of atmospheric air. The oxygen supposedly influences sugar synthesis indirectly by its influence on the intensity of the respiration process, to which the formation of sugar was found to be proportional.

The digestion of starch in germinating peas, W. R. JONES (*Plant World, 15 (1912), No. 8, pp. 176–182, figs. 7*).—It has been claimed that when peas

germinate the starch content does not disappear simultaneously in all parts but usually in a regular cell succession, beginning in the peripheral cells and passing inwards toward the vascular bundles. The author carried on a series of experiments to obtain definite information regarding this phenomenon, ordinary dried peas furnishing the material of the experiment. These were subjected to various tests from which it appears that an enzym, more possibly a zymogen activated by water, is present throughout the cotyledon and in the testa. It is also clear that this enzym is not formed by the action of the water of imbibition on the living protoplasm.

A number of peas were mutilated in various ways and placed to germinate. In the internal cells which had been exposed by mutilation digestion did not begin at once but at about the same time that cells in the same relative position in the control cotyledons began to show a solution of starch.

A study was made to determine the possibility of a quantitative difference in the amount of enzym present in different parts of the cotyledon, and it was found that there is a much greater enzymotic activity in the extract from the peripheral cells of the cotyledon than in any of the others. This, it is claimed, may be due (1) to an actually greater amount of enzym present in these cells, (2) to the presence of some inhibiting or retarding agent in the cells of the internal region, or (3) to the presence of an accelerating agent in the peripheral region. None of these problems has been fully investigated.

Influence of X-rays on germination, Mlle. G. Promsy and P. Drevon (*Rev. Gén. Bot., 24 (1912), No. 281, pp. 177–197, pl. 1, figs. 3*).—Studies were made on the germination of lentils, wheat, beans, and lupines under the influence of X-rays. At ordinary temperature the X-rays were found to exercise a variable effect on the germination of seed, depending on the quality and quantity of the rays employed, and the kind of seed, as well as unknown secondary factors. In general there was no increase in dry weight or in water content. The modifications that were observed in the structure of young plants seemed to be toward the generalization of tissues.

In the second portion of the report an account is given of the influence of temperature on the action of the X-rays, and this was found to be an important factor in determining their effect. Under ordinary conditions the germination of the seed was either accelerated or retarded, as mentioned above, but with a moderately high temperature the phenomena became very regular. With the exposure adopted the irradiation always favored germination and accelerated the development of the plants.

The influence of phytin on the growth of lupine seedlings, A. R. Rose (*Biochem. Bul., 1 (1912), No. 3, pp. 428–438*).—The author states that whatever its function in the seed during germination and growth, the phytic ion does not exert any marked stimulating influence when added to the substratum in which lupine seedlings are grown. A brief account of this investigation has been given (E. S. R., 27, p. 26).

On hydrocyanic acid, P. Wirth (*Teysmannia, 23 (1912), No. 7, pp. 405–418*).—This is a brief discussion of the history and present state of inquiry as to the localization, forms, origin, and influence or office of hydrocyanic acid in various plants containing it, notably several species of the genus Prunus.

Carbohydrates of the mangold leaf, A. V. Campbell (*Jour. Agr. Sci., 4 (1912), No. 3, pp. 248–259, figs. 3; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 593, II, p. 290*).—The author reports on a series of tentative investigations regarding the fluctuations of carbohydrates in leaves of *Beta maritima*, collected every 2 hours during the night and following day, September 16–17, 1910.

The percentages being expressed in terms of dry substance of the leaf, it was found that dextrose and levulose, which together constituted the principal part

of the sugars, did not fluctuate greatly, but that their curve showed a distinct response to light by these sugars. Cane sugar varied from 0.5 per cent at sunrise to 2.5 per cent at sunset, being produced mainly during illumination. Maltose showed about the same range as cane sugar, but in the opposite sense as regards time. This is held to be the last carbohydrate formed before translocation, and to be intimately connected with that process. Starch increased from about 5 per cent in the morning to 10 per cent at midnight. The curve of total carbon rose from 5 per cent in early morning to nearly 7 per cent about midnight. Old leaves contained less dextrose, levulose, and maltose than young leaves.

As regards the effects of fertilizers, potassium sulphate supplied in connection with other manures seemed to increase the quantity of sucrose and maltose, but to lessen the content of dextrose and levulose. Plats not treated with this salt suffered from early and severe attacks of *Uromyces betæ*.

A bibliography is appended.

The rôle of oxidases in the formation of certain constituents of essential oils, I, B. T. Brooks (*Jour. Amer. Chem. Soc., 34 (1912), No. 1, pp. 67–74; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 593, II, p. 288*).—Discovery of an oxidase in *Michelia champaca* led to investigation of the essential oils of various plants. Oxidases are said to be present in green caraway seeds, in flowers of peppermint (probably in all the mints), in tansy leaves, etc. Rye and peppermint are said to contain a catalase and valerian roots a lipase. The presence of oxidases is thought to explain the quick deterioration of many flowers after picking, especially if bruised.

The relation of wave length to antibiotic power of ultraviolet rays, Mme. and V. Henri (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 315–318*).—This is an account of the authors' studies with ultraviolet rays as to the proportion of their energy transmitted by screens of various composition and thickness, their absorption by albumen, and their power to kill bacteria. It was found that the last two properties increased or decreased in the same ratio, that both increased continually as the length of the waves decreased, and that the rate of increase was very large as the shortest wave lengths measured were approached. No optimum wave length for antibiotic action was reached.

A new contribution to the study of the effect of coal tar dust on plants, C. L. Gatin (*Ann. Sci. Agron., 4. ser., 1 (1912), I, No. 5, pp. 321–331, figs. 4; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1670–1672*).—In continuation of a previous report (E. S. R., 27, p. 333), the author gives the results of comparative studies with regard to the injurious action on neighboring plants of the various substances used for surfacing roads. The experiments were carried out with *Pelargonium zonale* and *P. peltatum* in two greenhouses of similar exposure and lighting, kept at temperatures of from 5 to 12° and of 20°, respectively. The plants were sprinkled with the dust or washings, partly collected from the roads and gutters, and partly prepared for this purpose.

As a result of the tests, the substances employed may be divided into two groups, the members within each being arranged in decreasing order of their deleterious influence. The materials found to be distinctly injurious were (1) a mixture of 60 per cent resin and 40 per cent anthracite oil without anthracene, (2) "tarvia," (3) gas tar, and (4) old or washed gas tar. Those slightly harmful or practically harmless were (5) "bitulithe," (6) asphalt, and (7) "boghead" tar. "Glutrin" and ordinary road dust showed no injurious action. The effect of the coal tar substances appears to be due chiefly to the tar vapors given off by the tar dust in contact with the leaf surfaces, causing either rapid deterioration of tissue, varnishing, yellowing, and perforation or a sort of leaf-

roll and abnormal cork formation. Further investigations on a larger scale are recommended.

Symbiosis, F. C. von Faber (*Teysmannia, 23 (1912), No. 7, pp. 444–460*).—The author gives a brief discussion of the literature, and of some recent investigations, mentioning some of his own of which a later account is promised.

Solanum commersonii and S. tuberosum, L. Planchon (*Bul. Soc. Bot. France, 59 (1912), No. 1, pp. 70–77*).—The author reports having grown *S. commersonii* from 1904 to 1907 without any apparent change except in the size of the tubers. In 1908 six tubers were again planted, and while no differences were noted in the aerial parts of the plants, when the tubers were dug they were found to resemble in every way those of *S. tuberosum*. The author claims never to have had in his garden either of the varieties of *S. tuberosum* that the mutants resembled, and he is convinced that under cultivation it is possible for some species to change to others or to resemble them so closely as to be indistinguishable.

FIELD CROPS.

The production of dry matter with different quantities of irrigation water, J. A. Widtsoe (*Utah Sta. Bul. 116, pp. 5–64, figs. 20*).—This bulletin presents results in dry matter production of various crops with different quantities of water, secured in experiments in progress for a number of years since 1902 on 2 farms near the station, and in cooperation with the Irrigation Investigations of this Office. A table is given showing the average annual rainfall of the locality to be 15.48 in. and the average annual temperature to be 47.1° F. In 1902, the average temperature of the irrigation water in June and July was 54°, in August 56°, and in September 53°, the maximum and minimum for the period being 63 and 45°, respectively. The results here presented are based on 665 single plat trials, including 152 with sugar beets, 142 with wheat, 124 with potatoes, 81 with corn, 49 with alfalfa, and from 6 to 16 for the other crops under experiment.

For several years the influence of the natural precipitation was studied on 2 series of plats, one receiving no irrigation while to the other 7.5 acre-inches were applied. The average results of this work seem to indicate that the natural precipitation and the soil water produced 85.8 per cent of the dry matter in wheat, 86.2 per cent in oats, 80.1 per cent in corn, 72 per cent in alfalfa, and 67 per cent in potatoes, as based on the dry matter in the corresponding crops grown with 7.5 in. of irrigation water. In this connection it was pointed out that the sum of the water stored in the soil, the rainfall during the growing season, and the water added by irrigation must be considered in crop production.

With few exceptions for all the crops studied the yield of dry matter increased as the quantity of irrigation water was increased. In the case of wheat, oats, and barley, the regular increase in the yield of dry matter with increasing irrigations was very marked. Wheat showed no deviation from the rule from the lower limit of 5 acre-inches to the upper of 50 acre-inches of water applied. Oats, receiving from 5 to 45 acre-inches, gave a similar result with the exception, however, of a small decrease in the yield of dry matter when 10 acre-inches were applied, which was more than made up with the application of 15 in. The yield of dry matter in corn showed a steady increase for all intermediate quantities of water from 7.5 in., the lowest, to 55 in. the highest quantity given.

In timothy, orchard grass, brome grass, and Italian rye grass, the yield of dry matter did not correspond so closely to the increase in irrigation as it did in the grains mentioned above. Alfalfa under irrigation showed an increase in

the yield of dry matter for every increase in irrigation water, excepting the use of 30 in. which was accompanied by a diminution. The largest quantity of water used, 50 in., gave the largest yield of dry matter.

Sugar beets and carrots, although fluctuating to some extent in the yield of dry matter, showed a general increase with the increase in irrigation. The sugar beets with 50 in. of water produced a slight increase in the yield of dry matter over the largest preceding yield. The carrots produced less dry matter with 7.5 in. than with 3.75 in. of water, but from that point on there was a steady increase up to the largest annual irrigation of 60 in. The increasing irrigations increased the yield of dry matter in potatoes steadily until 30 in. were applied when there was a diminution until 60 in. had been used. Onions and cabbage both increased their yield of dry matter as the quantity of irrigation water was increased, but cabbage yielded less dry matter with 25 in. of irrigation water than with either 20 or 40 in.

Without any exception the yield of dry matter per acre for each inch of irrigation decreased as the total amount of water used during the season increased, and in every case the largest yield of dry matter per inch of the total water, including natural precipitation, soil water, and the quantity applied in irrigation was produced with the smallest irrigation, and the smallest yields of dry matter per inch of the total water used in growing the crops resulted from the largest irrigations.

It was observed that the dry matter producing powers of the different crops varied considerably. A table is given showing the variation in yield per acre from 2,230 lbs. for orchard grass to 6,080 lbs. for sugar beets with 5 in. of irrigation water; from 1,775 lbs. for Italian rye grass to 10,757 lbs. for corn with 7.5 in.; from 1,773 lbs. for Italian rye grass to 13,092 lbs. for corn with 15 in.; and from 1,509 lbs. for Italian rye grass to 14,883 lbs. for carrots when from 40 to 60 in. of irrigation water were used. Of the 14 crops studied corn, barley, wheat, oats, alfalfa, sugar beets, and carrots were the highest producers of dry matter. Other data presented in tabular form show that wheat, oats, barley, and corn produce the largest proportion of grain with the smallest quantity of irrigation water. In the case of wheat grown with irrigation wtaer nearly 45 per cent of the plant above ground was grain, and this percentage diminished steadily with increasing irrigation until with 50 in. of water a little less than 33 per cent of the whole plant was grain. With the smallest irrigation of 5 in. nearly 56 per cent of the whole plant was straw, but with 50 in. the straw was a little over 67 per cent.

A study was further made of the quantity of water required to produce a pound of dry matter. The author defines transpiration ratio as the number of units of water passing through a plant to produce 1 unit of dry matter in the crop when harvested, and the evapo-transpiration ratio as the number of units of water passing through a plant plus those lost by evaporation from the soil surface belonging to the plant for each unit of dry matter produced. The evapo-transpiration ratio for the different crops was determined and is given in tables. As the quantity of irrigation water increased the evapo-transpiration ratio invariably increased. With wheat it varied from 856 to 1,809 lbs., with oats from 596 to 1,566 lbs., with barley from 513 to 1,263 lbs., and with corn from 276 to 1,087 lbs. With alfalfa the evapo-transpiration ratio varied from 621 to 1,480 lbs., increasing as the irrigation water increased, while for sugar beets this ratio varied from 569 to 1,186 and for carrots from 423 to 1,071 lbs. The comparatively small yields of dry matter per acre for cabbage and onions gave high evapo-transpiration equivalents, the variation being from 2,214 to 7,419 lbs. for cabbage and from 2,170 to 4,689 lbs. for onions. In determining the dry matter producing power of a given quantity of water, the

average results with wheat, corn, alfalfa, sugar beets, and potatoes indicated that when 30 acre-inches of irrigation water are spread over 4 acres, at least 3 times as much dry matter is produced as when the same quantity is spread over only 1 acre.

The yields of crops with different quantities of irrigation water, J. A. WIDTSOE and L. A. MERRILL (*Utah Sta. Bul. 117, pp. 69–119, figs. 12*).—The data presented in this bulletin were largely secured in connection with the work noted above. Tables are presented regarding actual yields of the various crops obtained with different quantities of water in an effort to discover methods whereby water may be used in the most economical manner.

In a test covering 5 years, the yield of wheat without irrigation was 39.22 bu. and with 7.5 in. of irrigation water 46.73 bu. per acre. The yield of straw was 3,934 lbs. without irrigation and 4,526 lbs. with irrigation. These results are regarded as indicating that 83.99 per cent of the grain and 86.42 per cent of the straw was produced with the natural precipitation. As the quantity of irrigation water was increased the total yield of grain increased steadily, but while the water was augmented from 5 to 50 in., or 10 times, the total yield increased only from 37.81 to 49.38, or less than one-third. With 5 in. of irrigation water, 7.56 bu. of wheat were obtained for each inch of water applied, while with 50 in. of water only 0.99 bu. was secured per inch. The same law was shown to exist in the production of straw, that is, the profitable use of water decreased inversely with the quantity of water used. It was further observed that the proportion of wheat and straw changes also, the grain decreasing while the straw increases. With 5 in. of irrigation water nearly 79 lbs. of straw and with 50 in. of water 108 lbs. were produced for each bushel of grain. When 30 acre-inches of water were used to cover 1 acre, 47.51 bu. of wheat were obtained and when spread over 6 acres, which made an application of only 5 acre-inches, the yield amounted to 226.86 bu.

The results with oats showed that of the total grain yield with 5 in. of water, 85.67 per cent, was produced with the natural precipitation and the per cent of straw due to the rainfall was 98.19 per cent. The results with different quantities of irrigation water indicated that 10 in. of water produced less than either 5 or 15 in. After 20 in. had been used there was no further increase in the grain but the straw continued to increase even with the greatest application of water. The yield per acre-inch of oat straw diminished from the smallest irrigation up to the largest, the 5-in. irrigation producing more than 5 times as much straw per acre-inch as the 45-in. irrigation. With 5 in. of water 34 lbs. and with 45 in. 46 lbs. of straw were grown with each bushel of grain.

The results with barley conformed in almost every particular to those obtained with oats and wheat, with the exception that as the quantity of irrigation water increased the total yield of grain decreased. Under the conditions of the experiment the use of 7.5 acre-inches of water seemed to give the maximum production of grain. The yield of straw, on the other hand, increased steadily up to the maximum irrigation of 39.5 in. With 7.5 in. of water 57 lbs. and with 39.5 in. 95 lbs. of straw were produced for each bushel of grain. The results in general indicated that barley is very sensitive to water and that the best yields will be obtained with moderate applications. The results with the 3 crops seem to show that wheat will endure more water than oats and oats more than barley and that within the limits of endurance the effect of water upon the 3 crops is practically the same.

In these experiments the average yield of corn without irrigation was 43.76 bu. and with 5 in. of irrigation water 53.93 bu., the yields of stover being 3,228 and 3,888 lbs. per acre, respectively. From these results it is concluded that 81.14 per cent of the grain and 83.03 per cent of the stover secured with 5 in.

of irrigation was due to the natural precipitation. With an application of 7.5 in. of water 10.6 bu. of corn and with 55 in. 1.08 bu. were secured per acre-inch. The total yield of stover with one exception increased steadily as the amount of water was increased, but the acre yield per inch of irrigation water decreased without exception as the total quantity of irrigation water was augmented. The proportion of stover to grain increased as the amount of water increased except in the case of the smallest irrigation. With 10 in. of water 67 lbs. and with 55 in. 106 lbs. of stover were produced for each bushel of grain. With the use of 30 acre-inches of water on 1 acre 97.12 bu. of corn and 10,390 lbs. of stover were secured, and when this same quantity of water was used on 4 acres, 316.56 bu. of grain and 28,756 lbs. of stover per acre were obtained.

In experiments with timothy, orchard grass, brome grass, and Italian rye grass, the annual applications of irrigation water varied from 5 to 100 acre-inches. In every case the yield from 100 in. was smaller than from the smallest quantity of water used. The 4 crops agreed in showing a temporary decrease in the total yield per acre after from 10 to 15 in. of water had been given and the yields indicated that the first maximum of irrigation lies somewhere between 10 and 15 in. and the second between 40 and 50 in. The yield of hay on 1 acre of timothy with 30 in. of water was 6,054 lbs. and when these 30 acre-inches were spread over 4 acres 11,928 lbs. With Italian rye grass 2 crops were grown with 4 variations in the irrigation water applied. With the first 3 variations, the second crop was smaller than the first, but as the amount of water increased the yield of the second crop approached more nearly that of the first. With 102 in. of irrigation water throughout the season the second crop was more than twice as much as the first. This is considered due to the fact that with the heavier application a larger proportion of the irrigation water reaches the second growth. The results in general indicate that these grass crops do not require great quantities of water and that by its proper use a good aftermath may be grown.

Alfalfa produced as a total of 3 cuttings 5,540 lbs. of hay per acre without irrigation and 7,178 lbs. with 5 in. of water. It is pointed out that 89.84 per cent of the first cutting, 68.5 of the second, 64.28 of the third, or 77.18 per cent of the total crop were secured with the natural precipitation, as compared with the crop grown under irrigation. Other data secured indicated a waste of water when more than 10 in. were applied throughout the season and the belief is expressed that from 10 to 15 in. of water is sufficient for a good yield of alfalfa. The yield of hay per acre with 30 acre-inches of water spread over 1 acre was 8,840 lbs., over 2 acres 15,093 lbs., and spread over 3 acres 29,653 lbs.

Sugar beets showed a gain of nearly 5 tons when the amount of water was increased from 5 to 10 in., but there was little increase in tonnage when more than 10 in. of water were given. An acre of land with 30 acre-inches of water applied produced 20.82 tons of beets, and when spread over 6 acres the same quantity of water gave a yield of 82.68 tons. The total yield of carrots increased, though somewhat irregularly, as the irrigation increased from 3.75 to 60 in. The yield per inch of irrigation water decreased as the water increased, the rate of diminution being similar to that of sugar beets.

The total yield of potatoes increased with the increase of irrigation water until 30 in. were used, when there was a noticeable decrease. Above this quantity there was a gradual increase up to 60 in. Between 5 and 20 in. the increase was steadiest. With 5 in. nearly 75 per cent of the crop was marketable and with 20 in. over 82 per cent. The percentage of marketable potatoes then decreased to about 77 per cent with 60 in. of water. Without irrigation 97 bu. and with 7.5 in. of water 145 bu. were obtained, showing that practically 67 per cent of the crop with a low irrigation was due to the natural precipita-

tion. Spread over 1 acre 30 acre-inches produced 195 bu. and spread over 6 acres 691 bu.

The results with cabbage seemed to show that 12.5 in. of irrigation water gives the best results. The yield per inch of irrigation water diminished rapidly with the increase in the water applied. With onions the total yield increased steadily with the increase of water to the maximum of 20 in.

The best returns for land, water, and labor, the crop-producing power of 30 acre-inches of water, and the new duty of water are discussed.

Methods for increasing the crop producing power of irrigation water, J. A. WIDTSOE and L. A. MERRILL (*Utah Sta. Bul. 118, pp. 125–164*).—This bulletin presents some results of work conducted to determine the best methods of using a definite quantity of irrigation water on a given land surface.

A study was made with wheat and oats as representatives of the small grains. In the first series of experiments about 3.5 in. of water were used, the applications being made about the middle of June and at the time the heads were filling out. The use of water at the time the heads were developing produced a gain of about 3 bu. of wheat per acre and a diminution of 461 lbs. of straw as compared with the crop obtained by the June application. The later irrigation, it is stated, seemed to enable the plant to transfer more nutritive materials from the stalks to the heads. The results of a second series of experiments, in which about 6.5 in. of water were applied in 1 or 2 irrigations, also indicated an advantage in applying water after the beginning of the irrigation season. In a third series of experiments with the use of 7.5 in. of water in 2 irrigations, either equal or one light and the other heavy, the largest yield of grain was secured when the water was applied in 2 equal irrigations and the next largest when the lighter irrigation came first. The yield of straw was smallest with 2 equal irrigations and largest when the heavy irrigation came first. The data tabulated in detail indicate that whenever the larger portion of water was applied between the opening of the irrigation season and the time when the heads filled out the returns were greatest. Throughout the experiments with wheat and oats it appeared that whenever the soil was kept approximately in a uniformly moist condition from the beginning of the irrigation season until the later stages of growth, the total yield of dry matter was the largest.

With 7.5 acre-inches of water, corn gave the best returns of grain per acre, but at the expense of the stover, when applied in 2 irrigations. With 15 in. of water in 3 irrigations, the largest returns were obtained when five-sixths of the total water was given in the first 2 irrigations. The next largest yield of grain was secured when the water was applied in 3 irrigations. When 25 in. of water were applied in 5 irrigations it made little or no difference whether the heavier irrigation came first or last, as each application was sufficient for the need of the plant during its maximum growth. The results with wheat, oats, and corn indicated that for the best total yield the water should be so applied as to keep the soil approximately equally moist throughout the season.

The results with sugar beets, with one exception, indicated that the greater the number of irrigations, though the total quantity of water remains the same, the larger are the yields obtained. It is believed that with 15 in. of water 4 irrigations are sufficient and that 3 irrigations would give very nearly the same result. Other data secured revealed the importance of applying water during July and August and indicated that during these 2 months the soil for this crop should be kept uniformly moist. The results from September irrigations were inferior, and it was found that less than 2 in. of water during this month was ample when sufficient quantities of water had been employed in July and August. Under the conditions of the experiments 5 in. applications of water every other week appeared to be the best practice. With carrots,

results similar to those with sugar beets were secured, and water applied in 5-inch irrigations every 2 weeks gave the largest yields. The authors believe that for the root crops the frequency of applications may be decreased as the total water applied throughout the season is increased.

With water varying from 5 to 15 in. throughout the season potatoes seemed to produce the largest yields of marketable tubers when each irrigation measured approximately 5 in. When 20 in. were used for the season it seemed immaterial whether 4 or 6 irrigations were given.

A study on the effect of the time of applying water on the yield of alfalfa, in which 25 in. of water were given in 4 equal irrigations, led to the conclusion that it matters little whether the irrigations are applied immediately before or just after each cutting.

The largest total yield of cabbage was obtained when 2.5 in. of water were applied weekly, but the largest return per acre-inch came from a biweekly application of 2.5 in. The largest yield of onions resulted from 1.38 in. of water applied semiweekly and the next largest yield from 5 in. applied weekly. The largest return per acre-inch, as in the case of cabbage, occurred when 2.5 in. were used every other week. The results showed that onions and cabbage required a continuously moist soil and that with sugar beets and carrots the best returns are secured when the water is applied in July and August, the 2 months of sunshine and best growing weather.

In a comparative study of the methods of applying irrigation water, corn grown with 7.5 in. of water gave slightly more dry matter with furrowing, but the yields of grain and stover were the larger with flooding. With 15, 20, and 25 in., flooding produced more dry matter than did furrowing. Wheat showed practically the same results, the yield of grain and straw being in favor of flooding. With oats, the results were not so regular, but in general the experiments with these 3 crops indicated the superiority of flooding over furrowing in the production of dry matter with a given quantity of water.

Potatoes with 15 in. of water produced practically the same yield of dry matter by the 2 methods of irrigation. With 20 in. of water there was a strong gain in favor of furrowing, but with 60 in. the yield was larger with flooding. The yields in bushels of potatoes showed practically the same results, but the differences were smaller. Cabbage also indicated that furrowing was slightly better than flooding.

Cultivation experiments were carried on to establish the value of cultivation in producing dry matter under field conditions. Corn and potatoes were grown, each receiving 20 acre-inches of water. In every instance the cultivated corn plats yielded more dry matter than the uncultivated, the largest yield being obtained when the first cultivation occurred 4 days after irrigation and weekly thereafter. When the cultivation occurred too soon after irrigation, the soil did not pulverize properly and a poor soil mulch resulted. When the first cultivation was delayed 7 days after irrigation there was a distinct loss in the yield of dry matter. Practically the same variation was observed in the grain and stover produced, though the plats cultivated the second day after irrigation yielded more grain and pounds of stover per acre than those cultivated on either the fourth or the seventh day of irrigation and weekly thereafter. Potatoes gave results similar to those with corn, except that the yields on uncultivated plats were relatively higher. The corn plat with no cultivation yielded the largest percentage of grain while the corresponding potato plat yielded the smallest percentage of marketable tubers.

In one experiment different quantities of seed wheat were sown on plats otherwise alike and given the same quantities of irrigation water throughout the season. As indicated by the yields of dry matter, the plants from different

rates of seeding did not develop in the same way or to the same degree. When grown closer together the plants did not stool so vigorously nor did each individual plant acquire the same degree of stalk and leaf development. The wheat crop in these experiments seemed to adapt itself automatically to water and soil. The amount of water in the soil and the soil itself appeared more important in determining the yield of dry matter than the amount of seed used. The results of another experiment led to the belief that, within certain limits, bunching the seed leads to better results than the more open distribution.

A study of the value of early spring flood waters with wheat, potatoes, and sugar beets showed definitely that some of the yield was due to the water applied prior to the irrigation season, but that water added during the irrigation season has a much higher value than water added earlier.

[Experiments with field and forage crops], J. B. THOMPSON (*Guam Sta. Rpt. 1911, pp. 10–12, pl. 1*).—In 1910, Large Mexican June corn, obtained from Manila, produced a decidedly heavier yield than the common native variety with which it was grown in comparison. Selected ears of each variety were shelled and dried September 9 and 10, and the seed was bottled and sealed and stored in a cool room. After 9 months of storage when this seed was planted, it was found that 3½ lbs. of seed of the introduced variety failed to produce a single stalk, while the seed of the native corn germinated almost perfectly. The varietal difference is not considered with certainty as the cause of this variation, as the result is based only on 1 trial. In 1911, 2½ acres of corn, partly planted with selected seed, was grown on the station grounds.

Para grass (*Panicum molle*) was introduced from Hawaii in 1910 and has given very promising results, especially for soiling purposes. The station has planted 3 acres with this grass and has given much attention to its propagation for distribution in the Island. *Paspalum dilatatum* withstood drought well without irrigation and continued to give good results, but did not make as good a record as Para grass. Guinea grass (*Panicum maximum*) was again grown and responded well to improved soil conditions. Results with this grass indicate its value for soiling purposes on fertile, well-drained, friable soil. Work with sorghums confirmed previous conclusions as to their value for forage production. Other successful field crops grown at the station included pigeon pea (*Cajanus indicus*), jack bean (*Canavalia ensiformis*), and peanuts.

Growth of clover as influenced by lime in different forms and amounts when applied to soil from the general fertilizer plats, F. D. GARDNER and B. E. BROWN (*Pennsylvania Sta. Rpt. 1911, pp. 60–76*).—Pot tests were made with clover on soil from a series of 36 plats devoted to long-time fertilizer experiments and receiving different fertilizer treatment. These pot tests were made for the purpose of determining whether burned lime applied in the required amount indicated by the Veitch method would promote or increase the growth of clover, whether an equivalent amount of finely ground limestone would be equally as effective and prompt in its action as the burned lime, and to measure the effect of 2,000 lbs. of finely ground limestone per acre in excess of the amount indicated and applied from the Veitch determination. At the close of the pot tests an examination was made to ascertain to what extent the lime of each form had actually neutralized the acidity indicated by the Veitch method.

The growth of clover on soil from each of the plats ranged from 2.6 gm. in a pot of very acid soil to 61.75 gm. in a pot of good sweet soil. Twelve of the plats were neutral or alkaline in reaction and 24 showed varying degrees of acidity. The sourest plat required 2,086 lbs. of CaO per acre 7 in. to neutralize the acidity indicated by the Veitch method. At the close of the pot tests

this amount left a further requirement of 485 lbs. Pots from this plat without lime produced 3.85 gm. of green clover, and when limed at the rate of 2,000 lbs. of limestone in excess of requirement the yield was 74.65 gm. The total of 2 crops, the second being slightly better than the first on 16 plats giving the best results was found equal to a production of 48,000 lbs. of green clover to the acre-foot of soil. Soil from limed plats showed a reduction in growth of clover when more lime was applied, and plats with a low lime requirement gave only a small increase in yield when treated with lime. All plats decidedly acid showed a marked increase in growth from lime treatment.

The results indicated that clover is not depressed by acidity requiring 500 lbs. or less of CaO per acre, but that above this amount the depression increases with the acidity up to a lime requirement of 1,500 lbs. of CaO per acre 7 in. when growth practically ceases. The use of land plaster left the soil slightly acid but the additional use of lime further depressed the growth of clover. Plats receiving nitrate of soda were not as acid as those receiving dried blood or manure. The highest degree of acidity was found in the soil receiving nitrogen as sulphate of ammonia, but when this was treated with lime or limestone it produced clover exceeding in amount the crops secured on soil from any of the other plats. The application of phosphorus as ground bone did not result in as high a degree of acidity as the use of an equivalent amount of dissolved bone black.

Lime influenced the root growth in the same manner and to somewhat greater degree than the development of the tops. The root growth was determined as 41 per cent of the growth of the tops and roots combined. For 18 plats giving best results with limestone the root growth in the pots was equal to 8,575 lbs. of dry matter per acre-foot of soil.

Of 48 soil samples treated with slaked lime and limestone in amounts sufficient to meet the lime requirement as indicated by the Veitch determination, only 2 were definitely satisfied when reexamined at the close of the pot test. When a ton of limestone in excess of the requirement was applied, only 2 samples were definitely determined as remaining acid at the close of the test. Slaked lime in amounts indicated by the method reduced the average requirement by 71 per cent as based on the average amount applied and on the same basis limestone reduced the requirement by 72 per cent. This result is regarded as showing that the amount indicated by the method should be increased by about 50 per cent in order to meet the real soil requirement. In these experiments, finely-ground limestone was found fully as prompt and effective in reducing soil acidity and promoting the growth of clover as equivalent amounts of slaked or caustic lime.

Cotton grading, M. Nelson (*Arkansas Sta. Circ. 15, pp. 4*).—This circular presents a discussion on cotton grading, enumerates the different grade values, points out the causes which reduce grade in cotton, and gives directions for taking samples to be graded by the college of agriculture in accordance with a plan of cotton selling on a grade basis adopted by Arkansas farmers.

The sorghum crop in Kansas, A. H. Leidigh (*Kansas Sta. Circ. 25, pp. 4*).—A popular discussion of the culture, value, and uses of saccharin and non-saccharin sorghums in Kansas.

Soy beans, A. E. Grantham (*Delaware Sta. Bul. 96, pp. 3–39, figs. 5*).—This bulletin gives a description of the soy bean plant, considers the adaptability of the soy bean to Delaware conditions, and discusses methods for the utilization of the crop as indicated by results secured at different experiment stations. General cultural directions are given and crop rotations are outlined. About 50 varieties are described, a number are especially recommended for

Delaware, and the results of a test of varieties for hay and seed production and of other experiments with the crop are reported.

Of 57 varieties tested, 30 produced 25 or more bushels of seed per acre. Among 10 varieties yielding over 30 bu. per acre, Wilson, Peking, Morse, and Arlington are mentioned as promising for high seed yields. These varieties were closely followed by Nemo, Hollybrook, Amherst, Austin, and Meyer. The hay yields are given for only 1 year, 1910. The varieties having twining tips made the best yields of hay and the Cloud variety appeared of special value as a hay producer.

The average results of a 4-year comparison of drilling the seed and cultivating the crop, with drilling solid and giving no cultivation, show a difference of 5.9 bu. per acre in favor of the solid drilling. A fertilizer experiment conducted for 4 years on soil of moderate fertility resulted in very little difference between the fertilized plats and those not treated.

A study made of the stage of maturity for cutting showed a higher percentage of fat, more crude fiber, and a smaller percentage of protein as the plant approached maturity and the beans developed. It is pointed out, however, that the increase in weight of the plant toward maturity will offset the higher percentage of nitrogen in the earlier cuttings, and that, therefore, the total protein harvested in the crop will be about the same although the percentage of protein in the earlier and later stages of development shows a wide divergence. Analyses made of soy beans for oil and protein showed that 17 varieties out of 51 contained 40 per cent protein. The difference in protein content ranged from 35 to 44.8 per cent, the average for the whole number of varieties being 39.2 per cent. The oil or fat content varied from 14.1 to 20.4 per cent, the average being 18 per cent. Only 4 varieties produced more than 20 per cent of oil. Very high oil and very high protein did not seem closely correlated. The variety ranking first in protein content with 44.8 per cent stood last in fat content with 14.1 per cent. Variety No. 1846, however, contained 39.5 per cent protein and 20.4 per cent of fat and gave a yield of 36 bu. per acre for the past 2 years.

In 1911, 4-lb. lots of soy beans of the Wilson and Peking varieties were sent out to more than 100 farmers for cooperative work. The average of the yields from the 4 lbs. of the Wilson was 240 lbs. and of the Peking 220 lbs. The best yield of the Wilson variety was 540 lbs., or 9 bu., and the best yield of the Peking 375 lbs., or 6 bu. 1 pk.

Current tobacco investigations.—Improving the yield of Pennsylvania Broadleaf tobacco, E. K. HIBSHMAN (*Pennsylvania Sta. Rpt. 1911, pp. 378–383, pls. 3*).—The conditions of tobacco culture in Lancaster County of the State are briefly reviewed and experiments undertaken by the station in cooperation with the Lancaster County Tobacco Growers' Association and with this Department are described.

In 1909, seed plants were selected on 17 different farms in Lancaster County representing 3 different soil types. The basis of selection was vigor of growth, number of leaves, shape of leaves, position of leaves relative to the stalk, number of suckers, and freedom from disease. The head of each selected seed plant was covered with a paper bag to prevent cross-fertilization, each seed plant was given a number, and when fully developed they were measured and recorded. In 1910, the seed secured from these selected plants was planted on an acre each of Hagerstown loam and Conestoga loam. In addition experiments were made with 5 of the more erect strains in normal and close planting and with high and low topping respectively. The fertilizer treatment and cultivation were the same at both stations. The crops secured in these experiments showed highly marked variations and the culture of the strains is to be

continued to determine the transmissibility of some of the properties found in the original tobacco seed plants.

A study was made of the distribution of leaf area from tip to heel and it was found that considerable variation occurs in the percentages of the total leaf area found in the different thirds of the leaf, as determined by dividing it by lines drawn at right angles to the midribs and calculating the resulting areas. In the upper third of the leaf the percentages varied from 8.9 to 37.2 per cent, the average being 24.5 per cent; in the middle third the variation ran from 41.4 to 67.3 per cent with an average of 47.7 per cent; and in the lower third it ranged from 18.1 to 35.4 per cent, the average being 27.8 per cent. It is pointed out that the area of the different thirds of the leaf has an important bearing on the amount of tobacco produced of a quality desirable for cigar making.

The production of hairy vetch seed, C. V. PIPER and E. BROWN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 102, pp. 8*).—After pointing out the sources from which the United States obtains hairy vetch seed, and presenting data on its importation from 1905 to 1912, inclusive, this circular describes European methods of growing the seed, together with means of separating it from rye, and gives directions for its culture in the United States. The tabulated results of American experiments in growing hairy vetch seed show yields ranging from 3 to 15 bu. per acre, the average for all trials being 6½ bu.

A comparative study on the removal of nutrient substances from culture solutions by different wheat varieties, B. E. BROWN and W. H. MCINTIRE (*Pennsylvania Sta. Rpt. 1911, pp. 77–89*).—The work reported involved growing 20 seedling wheat plants of each of 6 varieties for 4 successive 16-day periods in nutrient solutions of known strength. The varieties selected for this experiment were Dawson Golden Chaff, Fultz, Harvest King, Reliable, Rural New Yorker No. 6, and Rural New Yorker No. 57. The extreme variation in yield among these varieties the year before this work was conducted was only 3 bu. per acre. Determinations of the nitrates, potassium, and phosphoric acid in the solutions were made every fourth day and fresh solutions were supplied for the ensuing period. Data were further obtained with reference to transpiration and green weight, the effect of cumarin on transpiration and growth, and the relative oxidative power of the different varieties. Some of the principal results are summarized in the following table:

Total amount of nitrate (NO_3), potassium (K), and phosphoric acid (PO_4) removed by plants for all periods, together with the amount of water transpired and the green weight of the plants.

Variety.	NO_3.	K.	PO_4.	Transpiration.	Green weight.
	Parts per million.	*Parts per million.*	*Parts per million.*	*Gm.*	*Gm.*
Dawson Golden Chaff	632.60	420.50	209.7	1,250.0	44.60
Fultz	680.40	424.20	208.6	1,484.2	46.76
Harvest King	564.75	387.35	194.9	1,239.8	44.18
Reliable	628.30	383.30	210.0	1,320.3	43.40
Rural New Yorker No. 6	617.90	399.30	176.1	1,384.3	47.90
Rural New Yorker No. 57	624.10	398.45	201.9	1,409.5	43.60

Harvest King gave a yield in the field of 30.9 bu. per acre as compared with 30.3 bu. for Fultz. The fact that Harvest King gave a yield larger than Fultz, although removing less nitrates from the soil, is taken as indicating that some varieties possess stronger feeding powers than others, and that on a certain

soil a variety may do better than another provided the nutrient materials are present in sufficient quantities. Some varieties were apparently better able to withstand the degree of toxicity imparted to the solution by the cumarin than others.

A further study on the removal of nutrient substances from culture solutions by different wheat varieties, B. E. BROWN and J. H. BEATTIE (*Pennsylvania Sta. Rpt. 1911, pp. 89–102*).—A study was made of the absorptive power of 4 varieties of wheat, Valley, Velvet Chaff, Rudy, and Old Ironclad. The average yield for 13 years of Valley had been 30.71 bu. per acre and of Velvet Chaff 26.56 bu. per acre, while the average yield for 5 years of Rudy had been 30 bu. and of Old Ironclad 21 bu. Of each variety 10 plants were grown in a culture jar for 4 successive 3-day periods. The nutrient solutions contained of NO_3 100, K_2O 30, and PO_4 20 parts per million. At the close of each 3-day period the NO_3 content was determined but the data for K_2O and PO_4 were obtained by analyzing composite solutions representing the 4 periods or the entire 12-day series. A study was also made of the effect of cumarin, quinone, and vanillin, and the oxidative power of the varieties was determined.

Rudy and Old Ironclad, the varieties possessing the larger kernels, also produced the heavier plants. These 2 varieties also transpired more water and utilized more mineral constituents than the Valley or the Velvet Chaff. The effect of cumarin, quinone, and vanillin on transpiration, growth, and absorption varied considerably. The effect of cumarin was found to be more harmful than that of quinone or vanillin when 10 parts per million were added to the solution in each case. These results are believed as indicating that one variety can withstand certain harmful substances to a better degree than another variety. It is suggested that this factor may be controlled by the breeding of toxicity-resistant varieties. In all cases the plants growing in the check solutions removed more NO_3 than the plants in the treated solutions. When 50 parts per million of vanillin were added to the nutrient solution a very marked depression in the removal of NO_3 followed, but the effect on K_2O and PO_4 was not always the same. In general, cumarin affected the growth relatively less than it influenced the absorptive power of the plants, especially for NO_3. The Valley variety, which yielded more than Velvet Chaff, possessed a lower oxidative power, while Rudy, which yielded more than Old Ironclad, possessed the greater oxidative power.

The influence of fertilizers upon the composition of wheat, W. H. MCINTIRE (*Pennsylvania Sta. Rpt. 1911, pp. 173–193*).—Samples of wheat, grain, and straw were collected from 9 plats, Nos. 16 to 24 inclusive, which form a part of a series on which during the past 29 years a general fertilizer experiment has been conducted in connection with a 4 years' rotation of corn, oats, wheat, and grass. Every second year, plats 16, 18, and 20 received 6, 8, and 10 tons respectively of barnyard manure. Plats 17, 19, and 21 received 24, 48, and 72 lbs. respectively of nitrogen as dried blood with 48 lbs. of phosphoric acid in the form of dissolved bone black and 100 lbs. of potash as muriate. Plat 22 received 6 tons of manure and 4,000 lbs. of lime, the lime being added once in every 4 years. Plat 23 was limed with 4,000 lbs. of lime in the same manner as plat 22, and plat 24 served as a check. Some of the more important results of this study are given in the following tables:

Yields, weights per bushel and per 1,000 kernels, and hardness of wheat grown with different fertilizer treatment.

Plat No.	Yield of grain per acre.		Yield of straw per acre.		Weight per bushel.	Weight per 1,000 kernels moisture free.	Relative weight per 1,000 kernels dry basis.	Relative hardness.
	Actual.	Moisture free.	Actual.	Moisture free.				
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Gm.*		
16	1,514	1,319	2,783	2,560	61.4	33.87	113.5	108.7
17	1,213	1,048	2,801	2,579	60.0	32.08	107.5	107.8
18	1,719	1,511	2,741	2,515	61.2	33.38	111.1	110.7
19	1,633	1,427	3,232	2,988	61.6	31.88	106.8	104.3
20	1,882	1,650	3,712	3,409	61.4	33.02	110.6	109.5
21	1,648	1,440	4,321	3,968	61.6	33.10	110.9	106.7
22	1,622	1,415	2,959	2,728	62.1	33.75	113.1	111.6
23	909	788	1,345	1,235	60.7	33.12	111.0	100.8
24	688	584	1,298	1,190	60.5	29.84	100.0	100.0

Quantities of various constituents removed per acre in the grain and straw of wheat grown with different fertilizer treatment.

Plat No.	Crude fiber.	Crude fat, dry basis.	Crude protein.	Nonvolatile ash.	CaO.	MgO.	PO_4.	K_2O.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
16	1,135.4	63.5	203.4	110.7	6.62	8.94	18.5	37.6
17	1,082.9	55.3	173.5	115.2	6.58	6.69	17.6	42.0
18	1,126.7	69.5	228.7	116.5	5.77	9.56	19.8	36.5
19	1,272.4	72.0	220.9	116.8	6.85	7.89	20.0	44.6
20	1,531.8	81.2	260.0	148.3	8.00	11.78	22.2	46.0
21	1,649.1	87.6	269.3	156.6	10.74	9.81	24.2	61.7
22	1,202.4	69.4	213.3	147.1	10.70	9.14	21.6	34.9
23	507.6	38.2	126.6	72.8	6.08	4.60	12.7	15.6
24	475.8	23.6	108.8	62.7	4.17	3.84	9.3	16.1

Other data reported show that on the manured plats 97.3 per cent of the total nitrogen in the grain was in the form of albuminoid nitrogen, while on the plats receiving the mineral fertilizer 98.4 per cent of the total nitrogen was in the albuminoid form. The average of the aggregate amounts of the albuminoid nitrogen contained in the crop was in favor of the manured plats in the ratio of 28.7 : 23.3. The albuminoid nitrogen in the straw from the manured plats constituted 87.2 per cent of the total nitrogen, the corresponding figure for the plats receiving the commercial fertilizers being 84.1 per cent. The presence of lime seemed conducive to a reduction of the percentage of albuminoid nitrogen. Analyses of the grain showed a lack of amido nitrogen in the wheat from plats 17 and 19, but a large increase on plat 21 where it amounted to 0.09 per cent. Plats 16 and 18 showed an average of 0.03 per cent, while the grain from plat 20 contained 0.09 per cent.

The results secured with reference to nitrogen-free extract indicated that the mineral fertilizer treatment tended to increase the starch content of both grain and straw, while applications of barnyard manure were conducive to a decrease of starch formation.

Wheat improvement, F. A. SPRAGG (*Michigan Sta. Bul. 268, pp. 3–15, figs. 5*).—After giving brief notes on wheat varieties and wheat production in Michigan and on the origin of several common sorts, this bulletin describes the work of wheat improvement carried on by the station, and reports the comparative results secured with selections and crosses as yielders of grain, flour, and bread.

The varieties showing the greatest winter resistance in 1911–12 were American Banner, Craig Favorite, Bearded Rock, Berkeley, Harris, Stoner Miracle, Gypsy,

Ohio 5309, White Eldorado, Awnless Berkeley, and Canadian Hybrid. American Banner proved to be a high-yielding wheat of medium good quality, and Berkeley the wheat best suited for milling and baking purposes. This last variety has a weak straw and is only a fair yielder. Shepherd Perfection was the highest yielding red wheat at the station and was also among the best in bread-making qualities but it ranked rather low in winter resistance. Data on the relation of hardiness to milling quality, given in a table, indicate that the pearl wheats are better in milling qualities than the ordinary red wheats, which are generally considered to be better bread producers. The hard red type of wheats was the best of all in milling qualities.

HORTICULTURE.

[Horticultural investigations in Guam], J. B. THOMPSON (*Guam Sta. Rpt. 1911, pp. 12–25, pls. 2*).—The introduction and cultural tests of various vegetables (E. S. R., 25, p. 837) were continued in 1911. The vegetables have almost without exception produced better yields and the product has generally shown an improvement in quality. Similar work has also been conducted with a number of fruits, including pineapples, citrus fruits, Japanese persimmons, peaches, grapes, strawberries, bananas, and other miscellaneous fruits. The results secured in this work are briefly discussed, and notes are given on a number of miscellaneous tropical plants being tested at the station.

The author briefly reviews the present status of fruit growing in Guam, and gives a catalogue of fruits and trees bearing edible nuts or seeds used as food or beverage growing on the island.

Spraying cucumbers and melons, C. D. JARVIS (*Connecticut Storrs Sta. Bul. 72, pp. 85–123, figs. 9*).—This comprises a record of investigations in spraying muskmelons and cucumbers conducted during the period 1903–1911, inclusive. The results for each year are given and discussed and the work as a whole is summarized.

Bordeaux has proven to be the best remedy for spraying melons and cucumbers for the control of downy mildew and other diseases. Although it does not completely control the common diseases, 3 or 4 applications of Bordeaux in seasons favorable to the development of disease may keep the plants alive and in productive condition from 2 to 3 weeks longer than unsprayed plants. In seasons when downy mildew and other diseases are not troublesome or do not appear until late in the season, unsprayed plants are usually more productive than those sprayed with Bordeaux.

Bordeaux has an injurious effect upon the foliage of cucumbers and interferes with the proper setting of fruit. Injury to melons is mostly restricted to the foliage since sufficient fruit will have set before spraying commences. The spray, however, seems to retard the maturing of the fruit.

Weak Bordeaux (2:2:50) caused less injury and was nearly as effective as 4:4:50 Bordeaux in controlling disease.

Spraying both sides of the leaves is more effective in checking disease but also causes more injury to the foliage than in the common practice of spraying the upper side alone. There was a marked difference in the susceptibility of varieties to spray injury. Of the melon varieties observed, Emerald Gem suffered the least and Banquet the most.

Sprayings made early in the season were more injurious than late sprayings. The use of a fine spray, thus avoiding puddles on the foliage, gives the best results.

The various sulphur preparations, even when used at very weak strengths, caused serious burning of the foliage.

All varieties of melons seem to be equally susceptible to the attacks of fungi, but the earlier varieties often mature a full crop before they are affected by disease.

The bulletin concludes with recommendations for spraying cucumbers and melons.

The germination of packeted vegetable seeds, E. Brown and W. L. Goss (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 101, pp. 9, figs. 2*).—This circular contains the results of a series of tests conducted during the 5-year period, 1907 to 1911, to determine the vitality of packeted vegetable seeds. Germination tests were made of 18,571 packets, about one-third of which were purchased from mail order houses in 1911, and the other two-thirds bought at local stores in the previous years.

The germination of the mail-order and box seeds was 77.5 and 60.5 per cent, respectively. The seeds purchased from different mail-order houses were more nearly uniform in quality than the box seeds. The average germination of box seeds put up by one firm for 4 years was less than one-half of those put up by another firm. The low vitality of many of the seeds tested is regarded as the best evidence that packeted seeds should be sold with a guaranty as to the percentage of germination.

Pennsylvania fruit soils, and soil-variety adaptations, H. J. Wilder (*Pennsylvania Sta. Rpt. 1911, pp. 512–567, pls. 12*).—This paper discusses the need of soil selection for orchard purposes; soil-crop relationships as shown by various experiments and field observations; the soils of Pennsylvania with reference to their main or "series" divisions, including brief descriptions of each and their relative productivity; and the adaptation of different varieties of apples, pears, and peaches to particular kinds of soil, and some opportunities for orcharding on Pennsylvania soils as based upon these adaptations, land prices, and accessibility to markets, with reference to the development of both farm and commercial plantings.

Factors influencing yield, color, size, and growth in apples, J. P. Stewart (*Pennsylvania Sta. Rpt. 1911, 401–511, pls. 23*).—A record of experiments and observations bearing on the above subject. The paper is largely based upon the results of fertilizer and soil management experiments which have been conducted continuously in orchards in various parts of Pennsylvania since 1907 (E. S. R., 23, p. 341), the data here discussed covering the first 4 years of the work. Deductions are also made from relevant observations and experiments of other investigators.

After reviewing the statistics of production and planting, the author enumerates the various factors, both external and environmental, that may influence apple production and sets forth a principle or hypothesis indicating the general conditions under which any factor may become important. This hypothesis, here termed the "optimum" principle, is a modification and extension of the "law of the minimum." It provides that "plant growth and development increase as the more distant essential factors approach the optimum." Consideration is also given to experimental rules and precautions for conducting orchard investigations and the plan of the Pennsylvania experiments is discussed in detail.

In order to throw more light on the annual plant food requirements of apples, the available analyses of twigs, leaves, wood, roots, and fruit, together with data on annual weights of leaves, wood, and fruits produced by mature apple trees, and in some cases by peach trees, have been brought together and recalculated to a common basis. From this recalculated data, the author has computed a table showing the annual plant food draft of mature apples per tree and per acre. The physiological functions and characteristic effects of the mineral

nutrients, together with the toxic action of certain bases and its neutralization, are also discussed. The author concludes that certain anomalous effects of fertilizers upon fruits are explainable only on the hypothesis of basic toxicity and its neutralization.

The results of the Pennsylvania fertilizer experiments show in general that nitrogen, applied either in the form of manure or in commercial forms, is apt to exert an important influence on the yield; although this influence is less marked in droughty seasons. On account of its indirect reduction effect upon color, nitrogen can be used most freely on the earlier soils, or in localities with long-growing seasons, or on varieties without red fruit.

As the experiments progress the influence of phosphates and potash used in combination with other fertilizers on yield is becoming more important. When used in combination, potash is also showing an increased influence on size. Phosphates and potash have thus far exerted no influence on color, and appear to have no value when used alone. Contrary to results previously noted (E. S. R., 23, p. 341) the use of lime in some of the newer experiments has resulted in marked benefit, which benefit, the author suggests, may be due to the neutralization of the toxic effect of excess potash. In certain cases there appears to be a relation between fertilization and fire blight. This injury is most evident on the plats where the growth is most vigorous and succulent. A review of the literature of the subject leads the author to conclude that attempts to feed trees directly, by means of injections, have proved of little avail.

Results of the soil management experiments show in general that when used without fertilization rather marked differences appear between the 4 cultural methods compared, namely, clean tillage, tillage with cover crop, sod mulch, and sod. Used in combination with either manure or a commercial fertilizer, these differences are greatly reduced and in some cases reversed. The mulch method appears to be the best in most respects in the younger orchards, in which the bearing habit is not fully established. In the mature orchard, tillage with cover crop has proven far superior to mulching when no fertilizers were used, but inferior to mulching when fertilizers were applied with the mulch. The addition of manure in conjunction with various cultural methods has been generally beneficial.

On account of the lower moisture draft of legumes, together with their favorable nitrogen conditions, they are especially valuable as orchard cover crops. The hairy legumes were least exhaustive of moisture. The author found the distribution of feeding roots in apple trees to be relatively shallow. The maximum number of feeding roots, on the average, ranged from 2.7 to 12 in. below the surface. The author points out the many difficulties arising in the attempt to utilize the forces of variation and heredity in the improvement of apples, and concludes that the present evidence indicates, although it does not prove, the noninheritance of important variations known to exist between trees of the same variety under similar conditions.

The author found that the size of the crop on the tree has no influence on the size of the fruit until the former passes a certain critical point. Above this point, crop-size becomes a dominant influence. Below the critical point, other factors, such as moisture supply, cultural methods, fertilization, temperature, length of growing season, and probably pollination and number of seeds per fruit, all exert, either alone or in conjunction, an important influence on size.

As to the factors influencing color in apples, yellow colors appear to be independent of light and nearly all environmental conditions. Red colors are primarily dependent on sunlight, especially during the latter stages of maturity.

Exposure of apples to sunlight after picking increased their redness by 35 per cent, while checks in the dark and those exposed to electric light showed no definite increase. The present experimental evidence does not appear to justify any relation between abundance of iron in the soil or iron applications to color in apples. Certain arsenical sprays have shown distinct improvements in color, especially on peaches. Variation and heredity appear to have important relations to color in apples.

Bibliographies of papers and reports on the following subjects are included: Orchard fertilization, tree injections, cultural methods, cover crops, irrigation, scion selection, and other phases of plant breeding.

Classification of peaches, R. S. MACKINTOSH (*Pennsylvania Sta. Rpt. 1911, pp. 569–588*).—This paper describes and illustrates a scheme for displaying the more important characters of the peach in tabular form for use in identifying varieties and in forming groups based on certain combinations of characters. The varieties are grouped according to adhesion, color of flesh, and season. The descriptions used in the table are based upon the literature of the subject.

A field method for distinguishing certain orange stock, F. A. WOLF (*Alabama Col. Sta. Circ. 17, pp. 87–92, pls. 3, figs. 4*).—In a previous investigation conducted by the Bureau of Plant Industry, it was found that the Satsuma orange grows at its best on Trifoliate stock (E. S. R., 22, p. 538). The author here describes a field method for distinguishing Trifoliate stock from Sour stock, and from Yuzu stock which is sometimes employed in Japan as a stock for the Satsuma orange.

The stocks may be readily distinguished by differences in the leaves. When the leaves are absent, the roots possess characters which may be used in distinguishing the Yuzu from the Trifoliate stock. The typical stock of Yuzu has only 2 large roots with a few moderately thick smaller branches, while a typical Trifoliate stock has several large roots with numerous fibrous branches. These species can be distinguished also by difference in odor. When the cortex of the root is bruised, the Yuzu root emits a strong, penetrating, and somewhat disagreeable odor, while the Trifoliate root has a faint, much milder odor.

Another method, based on anatomical differences in the roots of the 3 species, is also described, and microphotographs are given of the pith of the Trifoliate, Sour, and Yuzu orange roots as a guide to their distinguishing characteristics. The author finds that these differences are so prominent that when once they are fixed in mind a nursery worker using a hand lens may be certain of his determination of the species.

FORESTRY.

Minnesota trees and shrubs, F. E. CLEMENTS, C. O. ROSENDAHL, and F. K. BUTTERS (*Minneapolis, Minn., 1912, pp. XXI+314, pl. 1, figs. 118*).—An illustrated manual of the native and cultivated woody plants of the State. The text deals with 100 genera, represented by 274 species and about 25 varieties. The descriptions and drawings have been derived largely and in some groups wholly from Minnesota material, although recourse has been made to other botanical publications where necessary.

The trees of Great Britain and Ireland, H. J. ELWES and A. HENRY (*Edinburgh, 1912, vol. 6, pp. IX+1335–1651, pls. 32*).—This is the sixth 2-part volume of an extensive treatise on the trees which are native or cultivated in Great Britain and Ireland (E. S. R., 23, p. 737).

In part 1 the varieties and species of Picea, Juniperus, Athrotaxis, Fitzroya, Saxegothæa, Torreya, Cephalotaxus, Keteleeria, Pseudolarix, Catalpa, Paulownia, Robinia, Gleditschia, Laburnum, Castanopsis, Umbellularia, Prunus, Pyrus, Magnolia, Halesia, Morus, and Eucalyptus are considered relative to their

botany, distribution, and cultivation, as well as the history and economic value of the more important forms. In many instances specimen trees growing in Great Britain are described.

Part 2 consists of illustrations and botanical drawings of the trees discussed in part 1.

Possibilities of western pines as a source of naval stores, H. S. BETTS (*U. S. Dept. Agr., Forest Serv. Bul. 116, pp. 23, pls. 4, figs. 3*).—This comprises a report of experiments conducted by the Forest Service during 1911 on western yellow pine in Arizona and California, and on both western yellow pine and piñon in Colorado, to determine the quantity of crude oleoresin which could be secured from these pines by the methods ordinarily employed in the turpentining of longleaf yellow pine in the Southeast.

The Arizona experiments show a yield of resin from western yellow pine (*Pinus ponderosa scopulorum*) about two-thirds as great as that obtained from southern yellow pines (*P. palustris* and *P. heterophylla*) in the average operations in Florida when the yields for an entire season are compared, the Florida season being from 5 to 10 weeks longer than the Arizona season. The average proportions of resin and turpentine in the gum were about the same as in gum from the southeastern pines and the turpentines of both regions are similar. The California experiments on western yellow pine carried on from July 7 to November 1 showed an average rate of flow slightly greater than that in the Florida experiments, the latter being conducted from March 17 to November 2. The author suggests that if the work in California had been started earlier, the weekly average flow would have been lower as a smaller yield is to be expected earlier in the season. Piñon (*P. edulis*) in Colorado had a rate of flow slightly over half that of the Florida pines for the period extending from June 9 to October 31. The volatile oils obtained from western yellow pine in California and from piñon in Colorado differ somewhat from ordinary turpentine, although it is believed they may be suited to industrial use.

In view of the promising amounts of turpentine and resin secured from western yellow pine and the decreasing amount of timber available for turpentine operations in the Southeast, it is believed that turpentine operations in the large tracts of virgin pine timber of the West will in time be justified.

Tapping rubber trees by electricity (*India Rubber World, 47 (1912), No. 3, pp. 142, 143, figs. 3*).—An electrical device for tapping rubber trees, which is said to have been successfully tried out on a small circuit of trees in Peru, is here described and illustrated.

Note on the preparation of tannin extracts with special reference to those prepared from the bark of mangrove (Rhizophora mucronata), P. SINGH (*Indian Forest Rec., 3 (1912), No. 4, pp. 35, pls. 4*).—This note comprises a brief résumé of the general processes of tannin extract manufacture and the factors which influence the manufacture of good extracts, together with a valuation of the mangrove barks as raw materials for tannin extracts. The commercial prospects of this industry in Burma are also discussed.

Extracting and cleaning forest tree seed (*U. S. Dept. Agr., Forest Serv. Circ. 208, pp. 23*).—This circular contains directions for the extraction and cleaning of seed from cone-bearing trees. The information, which is compiled from the experience of a number of members of the Forest Service, is designed to meet the needs of forest officers and others who extract and clean seed in small amounts without the aid of a fully equipped plant.

Forest conditions in Louisiana, J. H. FOSTER (*U. S. Dept. Agr., Forest Serv. Bul. 114, pp. 39, pls. 3, figs. 3*).—This bulletin describes the present forest conditions in Louisiana, discusses the problems which must be met in connection

with them, and gives an account of the progress already made in the establishment of a sound forest policy for the State.

The forest is described by regions, including the shortleaf pine uplands, longleaf pine, alluvial, bluff, prairie, and sea marsh regions. Among the problems considered are forest fires, grazing, lumbering, turpentining, forest taxation, development and maintenance of farm woodlots, planting, and management of state lands.

[Report of the] department of forestry, H. P. BAKER (*Pennsylvania Sta. Rpt. 1911, pp. 593–598*).—A brief statement of the station's work in the treatment of fence posts to increase durability (E. S. R., 25, p. 841), basket-willow experiments, forest nursery practice, woodlot management and reforestation, forest plantings, and extension work through the State.

[Report on the economic gardens], W. H. JOHNSON (*Ann. Rpt. Agr. Dept. South. Nigeria, 1911, pp. 8–14*).—This comprises a brief report of cultural tests on economic trees, shrubs, and plants in the several economic gardens in Southern Nigeria. Data are also given on experimental tapping of Para rubber trees, together with the results obtained in cultural tests of a number of annual crops.

Forest fires: Their causes, extent, and effects, with a summary of recorded destruction and loss, F. G. PLUMMER (*U. S. Dept. Agr., Forest Serv. Bul. 117, pp. 39, pl. 1, figs. 6*).—This bulletin comprises as a whole a history of forest fires in the United States and Canada. The subject matter is presented under the following general headings: Ancient fires, causes of fires, smoke phenomena of forest fires, historic fires, and statistics of damage and loss.

In the compilation of these statistics all available sources were searched, including the files of old newspapers and magazines, and such data used as can be expressed either in number of fires, area burned, thousands of board feet damaged, or the money value of the forest or forest products damaged.

Methods and apparatus for the prevention and control of forest fires, as exemplified on the Arkansas National Forest, D. W. ADAMS (*U. S. Dept. Agr., Forest Serv. Bul. 113, pp. 27, pls. 6, figs. 8*).—This subject is discussed under the following general headings: Losses from fire, the fire situation in the Arkansas National Forest, methods of fire prevention, measures for fire protection, methods of fire fighting, tests of towers and apparatus, and a new system of logging and fire lines.

Catalogue of publications relating to forestry in the Library of the United States Department of Agriculture (*U. S. Dept. Agr., Library Bul. 76, pp. 302*).—The present catalogue, which supersedes Bulletin 24 of the same series (E. S. R., 10, p. 643), consists of a classified list and an alphabetical author index. It contains over 4,001 entries, as compared with 1,237 in the previous bulletin, and includes all the books relating to forestry received by the Library previous to January 1, 1912. Entries for periodical and serial publications have been brought up only to the end of 1910.

DISEASES OF PLANTS.

Studies in the inheritance of disease resistance, II, R. H. BIFFEN (*Jour. Agr. Sci., 4 (1912), No. 4, pp. 421–429*).—In a previous publication (E. S. R., 19, p. 44) an account is given of investigations of the author on the F_2 generation of crosses between a number of varieties of wheats susceptible to attacks of yellow rust. These investigations showed an extraordinary degree of resistance on the part of some of the forms, while others were very susceptible. The study has been continued with these plants to determine whether the extracted immune types would breed true to the feature of immunity.

The results show that in every case the immune types have retained their power of disease resistance completely. The varying and probably constant degrees of susceptibility seen in the F_2 and succeeding generations are believed to be due to the extreme ease with which the degree of susceptibility is altered by slight changes in the plant's metabolism, and the effect of fertilizers of various kinds on rust production is briefly described.

In conclusion the author states that breeding for resistance to yellow rust is not especially difficult and that the failure to secure permanent rust resistant varieties is probably due to combining so many characteristics in one variety. The hybrids under his observation have reached the F_5 stage and are still as resistant as the original F_2 plants. From this the author concludes that the falling off of immunity and the gradual advance of the parasitic properties of the rusts take place too slowly to influence the work of the plant breeder.

Report of state pathologist for 1910, J. B. S. NORTON (*Rpt. Md. State Hort. Soc., 13 (1910), pp. 138–154*).—This report gives an account of the author's investigations on peach yellows and summer sprays, and lists miscellaneous diseases observed in his capacity as State pathologist.

As a result of the examination of more than 561,000 peach trees throughout the State, only 1.2 per cent were found affected by peach yellows. A study was made of the spread of the disease in the southern part of the State, and the author concludes that its southern spread has been very slight in the past 20 years, since it has progressed only a few miles in that time.

The experiments with summer sprays have been made to test the value of lime-sulphur compounds, particularly for spraying upon peach trees, and the tests show that this fungicide will greatly reduce the injury from scab. Some injury from Bordeaux mixture is reported, as shown in the condition of the fruit and foliage.

Brief report on plant diseases in Ohio for 1910, A. D. SELBY (*Ann. Rpt. Columbus Hort. Soc., 1910, pp. 13–19*).—The author briefly describes frost injury to forest trees, leaf scorch due to drought, some parasitic diseases of forest and shade trees, apple blotch of orchard trees, raspberry cane blight and some diseases of potato, tomato, and cabbage.

Report on the work of the Hohenheim Institute for Plant Protection, 1911, O. KIRCHNER (*Württemb. Wchnbl. Landw., 1912, Nos. 27, pp. 459–462; 28, pp. 472–475*).—This is a condensed account of investigations made in 1911 on diseases, enemies, and protection of economic plants of many kinds, including a discussion of sprays and apparatus for their use, also of various weeds.

Report of the mycologist for the year 1910, C. K. BANCROFT (*Fed. Malay States Rpt. Dir. Agr., 1910, pp. 5–8*).—This report briefly summarizes the author's observations regarding diseases of Para rubber, coffee, tapioca, camphor, and Ceara rubber. Most of the diseases of Para rubber have been noted elsewhere (E. S. R., 25, p. 353; 26, p. 451; 27, p. 854).

In a discussion of diseases of *Coffea robusta*, the author states that this species is subject to attacks by *Hemileia vastatrix*. Experiments have shown that spraying with Bordeaux mixture was successful in controlling this disease and that the strength recommended, 4:4:50, could be applied without injury to the plant.

Destructive insects and pests scheduled by the Board of Agriculture and Fisheries, H. C. LONG (*Gard. Chron., 3. ser., 52 (1912), No. 1344, pp. 241, 242*).—A list is given of 17 species of insect and fungus pests the introduction of which is prohibited in Great Britain. The order of 1910 relating to the occurrence of any of these pests is quoted.

Some new fungus diseases of economic plants, A. BONDARTSEV (*Izv. Imp. St. Peterb. Bot. Sada (Bul. Jard. Imp. Bot. St. Petersb.), 12 (1912), No. 2–3,*

pp. 101–104).—Brief descriptions are given of the following new species of fungi: *Ascochyta ribis*, occurring on the leaves of *Ribes rubrum; A. borjomi*, on the leaves of *Caragana arborescens;* and *Phyllosticta lychnidis*, on the leaves of *Lychnis chalcedonica.*

Some root diseases of permanent crops in the West Indies, F. W. SOUTH (*West Indian Bul., 12 (1912), No. 4, pp. 479–498*).—The results of observations on a number of root diseases of cacao, lime, and other perennials are given, the principal ones described being the white root disease, which is believed to be due to fungi belonging to the Hymenomycetes but as yet unidentified; Thyridaria root disease, due to *T. tarda;* black root disease due to *Rosellina bunodes;* red root disease of limes, due to *Sphærostilbe* sp.; and lime root canker, which may be due to several causes but seems to be associated with *Fomes lucidus.*

Infection experiments with parasitic fungi, II, O. TREBOUX (*Ann. Mycol., 10 (1912), No. 3, pp. 303–306*).—In continuation of a previous account (E. S. R., 26, p. 845), descriptions are given of experiments with 10 species of rusts in which the author undertook to determine the alternate host plants.

Blossom infection by smuts and natural distribution of smut diseases, O. BREFELD and R. FALCK (*Invest. Gen. Field Mycol., 1912, pt. 13, pp. 59, pls. 2*).—This is a translation by Frances Dorrance of work previously noted (E. S. R., 18, p. 449).

The morphology and parasitism of Rhizoctonia, F. J. F. SHAW (*Mem. Dept. Agr. India, Bot. Ser., 4 (1912), No. 6, pp. 115–153, pls. 11, figs. 5*).—A study was made of the Rhizoctonia on peanuts, cowpeas, jute, and cotton to determine the possible existence of physiological races of the fungus.

No morphological differences could be noted, but inoculation experiments indicated that the form attacking jute differs from that on the other host plants in that it would not infect any species other than jute. The form isolated from cowpeas, peanuts, and cotton infected all of the host plants in varying proportions, although the Rhizoctonia from cowpeas inoculated jute only when the jute plants were slightly wounded.

The species studied was identified as *R. solani*, and its relation to a possible perfect form is discussed.

Experiments in soil treatment for protecting jute from attack showed that carbolic acid protected the plants though it lowered the percentage of germination to some extent. Naphthalin proved very destructive to the seeds and seedlings.

Specialization of Uromyces caryophyllinus, E. FISCHER (*Mycol. Centbl., 1 (1912), No. 10, pp. 307–313*).—A detailed report is given of studies (E. S. R., 27, p. 351) in which the author states that *U. caryophyllinus* exists in 2 forms, one of which is present on *Tunica prolifera* but does not attack *Saponaria ocymoides.* The other form lives upon *S. ocymoides* but so far has not been successfully transferred to *T. prolifera.*

Nematodes in oats, dry spot of oats, and mildew on winter wheat and other grains, K. STÖRMER and R. KLEINE (*Illus. Landw. Ztg., 32 (1912), No. 51, pp. 471–473*).—A brief report is made on the appearance of dry spot of oats ascribed to the influence of alkaline substances and lime on the roots; the injury to oats caused by *Heterodera schachtii*, with a brief account of the life history of this nematode and its relations with other plants; and the appearance and ravages of *Erysiphe graminis*, said to have been favored by previous damp weather. Suggestions as to treatment are given in each case.

Leaf stripe of barley, K. STÖRMER (*Deut. Landw. Presse, 39 (1912), No. 50, p. 587; Illus. Landw. Ztg., 32 (1912), No. 50, pp. 465, 466*).—This is a brief discussion of the author's observations on this disease, noted on both winter and

summer barley and said to be due to the presence of *Helminthosporium gramineum*, attacking all parts of the plant. It is here held that the fungus is carried over in the seed. Treatment of this with copper sulphate or formalin is recommended, especially the copper sulphate, in a solution of which the seed are soaked for 16 hours, then quickly dried, and planted as soon afterwards as possible. Other treatments, said to be less effective, are also described.

Leaf stripe of winter barley (*Illus. Landw. Ztg., 32 (1912), No. 63, pp. 575, 576*).—This is a brief discussion of the present state of knowledge of this disease, said to be caused by *Helminthosporium gramineum*. The fungus is thought to be carried over in the seed. The planting of resistant varieties is recommended.

Urophlyctis alfalfæ, a fungus disease of alfalfa occurring in Oregon, P. J. O'Gara (*Science, n. ser., 36 (1912), No. 928, pp. 487, 488*).—In 1910 the author observed a crown-gall disease of alfalfa occurring in the Rogue River Valley of Oregon, and in 1911 the disease had become so serious that an investigation was carried on regarding it.

An examination of plants in infested areas showed that the crown and part of the stems just above the crowns were infested with numerous galls. The disease seems to affect the shoots or stems as well as the crowns and roots, and many specimens were found where the galls occurred several inches above the crowns.

It has been claimed that the fungus was most destructive to plants in damp soil, but the author's observations indicate that this is not true, as the disease is quite as serious in sandy loam and gravel soils as in heavy, poorly drained ones. The most serious injury, however, is attributed to a lack of drainage.

An examination of the galls showed that the disease is due to the fungus *U. alfalfæ*, which has been reported in South America and Europe but had not been recognized in the United States until 1909 (E. S. R., 21, p. 549).

Clover canker, L. Hiltner and G. Gentner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 7, pp. 73–79, fig. 1*).—Experiments and observations by the authors led to the conclusions that clover canker, which has been ascribed to the activity of *Sclerotinia trifoliorum* but may be due partly to other fungi, is indirectly and partially the cause of clover sickness in soils and that this condition can be considerably lessened by the employment of calcium sulphate and potassium salts as fertilizers.

A disease of corn in Cochin China, E. Foëx and P. Berthault (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 12, pp. 552–554*).—The authors report having received ears of corn from Cochin China in which the cob was of a grayish color and brittle and the grain more or less discolored and diseased, particularly in the region of the pericarp. An examination of the material showed that it was attacked by a fungus, which the authors propose calling *Dothiorella zeæ* n. sp. It has been cultivated in the laboratory but has not fruited. Nothing is known regarding the infection of maize in Cochin China, nor have the authors been able to study the parasite in relation to its host.

Biochemical studies on potato leaf-roll disease.—IV, Some observations on the physiology of the tubers, G. Doby (*Kisérlet. Közlem., 15 (1912), No. 2, pp. 223–226; Ztschr. Pflanzenkrank., 22 (1912), No. 7, pp. 401–403*).—The author reports on a comparative study of the enzymotic activities of diseased plants in connection with their altered contents (E. S. R., 27, p. 650).

From the results noted the conclusion is reached that in conformity with Palladin's theory of anaerobic respiration in plants (E. S. R., 27, p. 426), a correlation probably exists between the decrease of insoluble protein and starch on the one hand and high concentration of oxidases on the other in plants

affected with leaf roll, the respiration of the diseased potatoes being increased by an abnormal enzymotic activity in this case.

Report on the prevalence of potato blight in Ireland to July, 1912 (*Dept. Agr. and Tech. Instr. Ireland Jour., 12 (1912), No. 4, pp. 759–761*).—A compilation is given of reports regarding the occurrence and spread of potato blight in Ireland to the middle of July.

The past year has been exceptionally favorable for the development of the fungus. At the above date the disease was generally distributed, as spraying had been made impossible during June on account of the continued wet weather. It was undertaken, however, in July when the weather conditions became better, and it was thought that a continuation of bright dry weather would tend to counteract the effects of an unusually early outbreak of the disease.

Preliminary report on "ufra" disease of rice in Noakhali district, E. J. BUTLER (*Dept. Agr. Bengal Bul. 2, 1912, pp. 3; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1661–1670*).—Studies on "ufra" disease in the delta district gave results summarized as follows:

This disease, appearing at the end of the rains in September, shows three forms or stages, distinguished by (1) attack before the head forms; (2) failure of the head to emerge; and (3) failure of the grain to set. No insect or fungus has been shown to be constantly associated with the disease, but a nematode, Tylenchus, was present in all diseased plants investigated, and is suspected but has not been proved to be the cause of the disease. It has not yet been shown to enter the tissues. The fact that the crop, or its long and heavy stubble, is on the ground most of the year favors the perpetuation of either nematodes or fungi. Further investigations are considered necessary.

Does the sereh disease exist in the West Indies, especially in Trinidad? F. A. F. C. WENT (*West Indian Bul., 12 (1912), No. 4, pp. 554–560*).—The author reports upon diseased sugar cane submitted to him from Trinidad which exhibited some of the symptoms of the sereh disease of Java. This disease has not hitherto been reported on the American Continent and the author hesitates definitely to pronounce it as such.

Accompanying this paper are memoranda by W. G. Freeman and a committee appointed by the Trinidad Board of Agriculture, in which they state that there is as yet no definite evidence of the disease in Trinidad. Some of the more prominent symptoms of sereh were not exhibited in the diseased cane in question and the committee thinks that additional investigation should be carried on to determine the exact status of the problem.

Cedar apples and apples, F. E. LLOYD and C. S. RIDGWAY (*Ann. Rpt. Ala. Dept. Agr. and Indus., 1911, pp. 11–27, pl. 1, figs. 12*).—A description is given of the effect of Gymnosporangium on cedars and the relation of this fungus to the rust on apples. It is said that some varieties resist the attack of the fungus almost entirely, and lists are given of resistant varieties, those slightly affected, and those very subject to attack.

Experiments on control of chlorosis in pear trees, H. SCHELLENBERG (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 432–437*).—This is a brief report on some attempts to remedy a chlorotic condition in pear trees.

Iron sulphate applied to the soil surface in the form of powder or solution caused no change in the appearance of the trees. Periodic applications of liquid manures containing potassium nitrate and superphosphates gave in some cases, apparently, more favorable results. Sulphates of iron and ammonium, sealed up in holes bored in the trunk on July 9, gave better results, as on the branches directly above the point of application the leaves soon fell and new leaves developed, the earliest of which showed normal size and color by August 10, while

the leaves on the other parts of the tree remained chlorotic. The best results, it is thought, require application of this treatment on different sides of the tree.

The control of peach leaf curl, C. B. WEEKS (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 8, pp. 359–362, figs. 2*).—The author gives the results of his experience with *Exoascus deformans*, causing leaf curl. The first crop of fruit was lost by complete defoliation in April, the second by sunburn of the exposed branches followed by failure to bloom the following spring.

The varieties most susceptible to attack are said to be Elberta, Early Crawford, Late Crawford, Susquehanna, Hale Early, Lovell, and Muir in the order named, the last-named appearing to be nearly immune to the disease.

Bordeaux mixture is said to give practically absolute control if sprayed on between November 15 and December 15, in a strength of 7 lbs. of copper sulphate and 7 lbs. of lime to 50 gal. water or if used in early spring in a strength of 4:4:50. If neglected until green leaves appear, a strength of 2:2:50 is said to be safe, and helpful until the leaves are half grown. Lime-sulphur 1:11 sprayed on just as the blooms are beginning to open is said to have a marked fungicidal value.

The chlamydospores of black rot, P. VIALA and P. PACOTTET (*Ann. Sci. Agron., 4. ser., 1 (1912), I, No. 4, pp. 283–294, figs. 10*).—The authors report in detail upon their studies of the chlamydospores of the black rot fungus (*Guignardia bidwellii*). These reproductive organs are said to be rarely found in nature though commonly met with in laboratory cultures.

Experiments in combating Peronospora, H. SCHELLENBERG (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 420, 421*).—This is a brief account of some recent experiments with different preparations for combating downy mildew of grapes. It is stated that a substitute for Bordeaux mixture, at once satisfactory and inexpensive, was not found.

Smoke and mildew, L. CROUZAT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 27, pp. 8, 9*).—In connection with the intensity of attack by mildew in the neighborhood of Barbentane, France, in the summer of 1912, the author mentions a case previously observed by him in which he supposes attack of mildew to have been prevented or lessened by the overlying smoke from fires built to prevent frost injury on the level plains, the neighboring elevations which were not overhung by the smoke being severely attacked by the disease. It is suggested that the thick cloud of smoke may have prevented the formation of the heavy dews that favor the rapid development of spores favorable to severe infection by the fungus.

Mildew and copper salts, S. ANDRÉ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 27, pp. 9–11*).—The author, having tested a modification of Bordeaux mixture at 2 per cent strength, states that this proves effective against mildew of grapes if used at suitable times and in proper quantity. It is said that the latter part of April or the first week of May is as early as this application is advisable, and that all green parts should be well covered with the solution.

Permanganate of potash in viticulture, C. TRUCHOT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 29, pp. 73–75*).—In order to provide a remedy for grape Oïdium not injurious to sensitive vines, the author offers three formulas claimed to be harmless to such varieties as Othello and reasonably effective. The first of these employs 85 parts powdered lime and 15 parts powdered permanganate of potash, and the second replaces 65 parts, and the third all of the lime with sulphur. This is to be dusted on the plants when the young shoots are from 5 to 10 cm. long, before and during the flowering period, and about once thereafter at the rate of about 25 kg. of powder per hectare. If, in spite of this, Oïdium appears, spraying is recommended with a solution containing

0.125 per cent of permanganate and 3 per cent of lime, the last-named component being added to secure adherence of the mixture to the surfaces.

A note on the life history of Cystopsora oleæ, S. L. Ajrekar (*Ann. Mycol., 10 (1912), No. 3, pp. 307–309, figs. 3*).—In a previous publication (E. S. R., 24, p. 152), a description is given of this fungus occurring on *Olea dioica*. Subsequent studies have been made on the life history of the fungus, and infection experiments have shown that it is possible to produce the disease from teleutospores with a production of both æcidia and spermogonia. Later observations showed teleuto sori on leaves which had become infected with æcidiospores, indicating that the life cycle of this rust fungus is complete without a uredo stage.

Chlorosis of oranage and other plants on ferruginous soils, R. Averna-Saccá (*Bol. Agr. [São Pauló], 13. ser., 1912, No. 2, pp. 129–150, figs. 3*).—Observations and analyses made of soils and plants and experiments with remedies led the author to the conclusions that chlorosis of grapevines, coffee plants, orange trees, etc., is due in the main to a deficiency not of iron but of magnesium, and that magnesium carbonate in solution, applied to the roots in such soils, gives good results. An extensive bibliography is appended.

A fungus disease of breadfruit, F. A. Stockdale (*Jour. Bd. Agr. Brit. Guiana, 6 (1912), No. 1, pp. 14–16*).—A description is given of a disease of the breadfruit which is characterized in its earliest stages by the presence on the surface of the fruit of small brownish spots nearly circular in outline. The disease may affect the breadfruit at any stage of its growth, and if the diseased areas are examined closely when they are dark brown in appearance, small pin points of a pinkish-gray color will be seen. In these were found the spores of the fungus, and inoculation experiments have shown that the disease can be produced in healthy fruits within 48 hours. The fungus responsible for the trouble has not yet been definitely determined, but it is thought probable that it will prove to be a species of Glœosporium.

For the control of the disease the author recommends the collecting and burying of all diseased fruits and spraying the trees with a 4 per cent solution of copper sulphate or with Bordeaux mixture. Experiments conducted in 1910 at the botanic gardens, in which the badly infested fruits were destroyed and the trees sprayed with Bordeaux mixture, showed that the disease could be readily controlled in this way.

Root diseases of Hevea, T. Petch (*Trop. Agr. and Mag. Ceylon Agr. Soc., 39 (1912), No. 2, pp. 153–156*).—This article is largely a discussion of a bulletin by Bancroft (E. S. R., 27, p. 854) relating to the cause of root disease of Hevea and means by which the fungus is spread. It is claimed that instead of being due to *Fomes semitostus*, as has been frequently reported, the true cause of the disease is *Polyporus lignosus*, a fungus which in the dry state greatly resembles Fomes but when fresh is readily recognized as distinct.

Fighting the chestnut tree blight disease in Pennsylvania, M. A. Carleton (*Amer. Fruit and Nut Jour., 6 (1912), No. 97, pp. 78, 79, figs. 2*).—The author describes the methods adopted for combating the chestnut tree blight disease and notes some of the results that have been already secured. Among the observations of special interest, the author notes the fact that in a region where the chestnut trees were cut over in only a few instances have the sprouts shown any indication of the recurrence of the disease.

The means of disseminating the disease are said to be undetermined, but any wound seems to favor the entrance of the fungus. Plant pathologists have been studying the fungus, and it is reported that two forms have been recognized, one of which, occurring in the vicinity of Connellsville, Pa., is entirely

harmless, while the other, which is more common and more generally found in the eastern part of the State, is an active parasitic form.

Treatment of ornamental chestnut trees affected with the blight disease (*Penn. Chestnut Tree Blight Com. Bul. 2, 1912, pp. 7, pl. 1, fig. 1*).—This is intended as a guide for the treatment of individual chestnut trees affected by blight.

Following a description of the disease, methods of treatment are recommended which consist of cutting away the infected portions of the trees, painting the wounds with an antiseptic, and after this has dried covering them with waterproof solutions. It is stated that all wild and cultivated varieties of American and European chestnuts are susceptible to the blight, but not to the same degree. Pure strains of Chinese, Japanese, and Korean chestnuts are almost, if not quite, immune, but the hybrids of these species with native trees appear to lose this immunity.

Diseases of the English walnut in California, R. E. SMITH (*Amer. Fruit and Nut Jour., 6 (1912), No. 97, pp. 74, 75, figs. 2*).—The author describes bacteriosis, die-back, and perforation of English walnuts, these being the more important diseases of the English walnut in commercial plantations in California.

The greatest amount of loss is said to be due to the bacteriosis, an average loss of at least 50 per cent of the crop in the seedling groves of southern California being reported. Spraying the trees and the use of late varieties are recommended for the control of this trouble.

Two forms of die-back are described, one which is distinguished by the gradual dying of the older trees, and the other which occurs suddenly during the winter and may affect the tree to the ground. These troubles are associated with lack of moisture in the soil, and winter irrigation is recommended for their prevention.

The perforation which is described consists of a nondevelopment of portions of the outer hard layer of the shell. It is believed to be associated with conditions at the time of pollination and the lack of nutrition during the development of the fruit.

In addition to these diseases, trunk rot, sunburn, erinose, yellows, and crown gall are mentioned as of comparatively slight occurrence.

A disease of cultivated mint, E. FOËX and P. BERTHAULT (*Jour. Agr. Prat., n. ser., 24 (1912), No. 41, pp. 461, 462, figs. 6*).—The authors describe a disease of mint in which the stems and rhizomes were badly attacked by a fungus. This was isolated, grown in culture media, and determined as *Fusarium dianthi*.

Adherent spraying mixtures, J. WEINMANN (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 29, pp. 85–92*).—In extension of previous work (E. S. R., 27, p. 753), the author presents the results of later experiments intending to secure not only adherence of the liquid to surfaces of different character but also to reach parts ordinarily difficult of access with fungicides. In addition to a discussion of the principles involved, 15 formulas are presented, most of which employ Bordeaux or Burgundy mixture in connection with gelatin, soap, Sapindus, polysulphids, etc., which are claimed to fulfill the requirements.

The chemical composition of the fungicide "Forhin," F. KOCZIRZ (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 6, pp. 755–757*).—The results of analyses of a trade fungicide are given, from which it appears that the most important constituent is copper sulphate, the paste being composed of 40.8 per cent of that compound. In addition there is some sulphur, lime, and organic substances, mostly molasses and oil, which are added to increase the adhesiveness of the fungicide. It is claimed that a 1½ per cent solution of this fungicide

is equal to 1 per cent Bordeaux mixture, but the author holds that based upon its copper sulphate content the proportion would be about $2\frac{1}{2}:1$.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The economic status of the meadow lark in California, H. C. Bryant (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 6, pp. 226–231, figs. 2*).—Ranchers in the San Joaquin and Sacramento Valleys report that meadow larks have caused a loss of from one-third to one-half of their grain crops. Abundant proof of their depredation in grainfields has been afforded by stomach examinations, birds taken during the winter months having been found to contain little else than grain, as many as 30 kernels of oats with enough hulls to account for as many more kernels having been found in a single stomach. Field investigations have shown that the birds prefer oats, and that oats and wheat are the only grains damaged to any extent. Injury is also caused through their habit of drilling holes in melons.

As a destroyer of cutworms and grasshoppers in California the meadow lark is probably unequaled by any other bird, as many as 66 cutworms and 30 pairs of mandibles of grasshoppers having been found in a single stomach. "Stomachs of birds collected in grainfields during the months of April and May have been found filled with cutworms almost exclusively. Birds taken during the summer months are found to contain grasshoppers to such an extent that the average ranges between 75 and 90 per cent. It thus appears that the birds in the same locality where they do damage later on perform a valuable service in exterminating insects which are well-known as destroyers of grain."

The amount of injury caused depends very largely on the locality and kinds of crops raised; in certain localities they may be the source of injury and in other localities of inestimable value. To the grain grower the meadow lark may be a foe, but to the grower of alfalfa it may be, and doubtless is, a valuable friend.

Tables are given which show the food habits of the meadow lark for different months of the year, based upon an average of 6 birds collected each month in grainfields in the vicinity of Red Bluff, Tehama County, Cal., and of meadow larks taken in alfalfa fields in the vicinity of Hanford, Kings County, Cal.

Game protection, J. Kalbfus (*Penn. Bd. Game Comrs. Bul. 1, 1911, pp. 29, pls. 4*).—A general discussion of game protection in Pennsylvania.

An annotated list of the literature on insects and disease for the year 1911, R. W. Doane (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 268–285*).—This is a classified list of the literature issued during 1911.

Check list of California insects, I, II, III, C. W. Woodworth (*Mo. Bul. Com. Hort. Cal., 1 (1912), Nos. 7, pp. 297–312; 10, pp. 782–790; 12, pp. 914–919*).—This list of California insects, commencing with the Lepidoptera and arranged in alphabetical order in their respective families, is said to be preliminary to a comprehensive report.

Twenty-sixth report of the state entomologist on the noxious and beneficial insects of the State of Illinois, S. A. Forbes (*Rpt. State Ent. Ill., 26 (1911), pp. 160+XIX, figs. 133*).—The first part of this report consists of brief popular accounts of Some Important Insects of Illinois Shade Trees and Shrubs (pp. 1–67), including the catalpa sphinx, fall webworm, yellow poplar caterpillar (*Apatela populi*), walnut caterpillar (*Datana integerrima*), white-marked tussock moth, brown-tail and gipsy moths, forest tent caterpiller, common canker-worm or spring cankerworm, lilac borer (*Podosesia syringæ*), 2 poplar borers (*Memythrus tricinctus* and *M. dollii*), a Viburnum borer (*Sesia pictipes*), the maple borer (*S. acerni*), ninebark borer (*S. scitula*), bagworm, poplar and

willow borer (*Cryptorhynchus lapathi*), dogwood twig girdler (*Oberea tripunctata*), locust borer (*Cyllene robiniæ*), oak twig pruner (*Elaphidion villosum*), bronze birch borer (*Agrilus anxius*), scurfy scale, oyster-shell scale, San José scale, Putnam's scale, walnut or willow scale, and cottony maple scale.

A paper on Miscellaneous Economic Insects, by C. A. Hart (pp. 68–98), deals with the heartwood borer (*Parandra brunnea*), *Anomala binotata*, green fruit worms (*Tæniocampa alia*? and *Xylina antennata*), apple flea weevil (*Orchestes canus*), strawberry leaf roller, strawberry crown girdler (*Otiorhynchus ovatus*), blackberry leaf roller (*Exartema permundanum*), and black gnats in cucumber houses (*Sciara* sp.).

In a paper, On the More Important Insects of the Truck Farm and Vegetable Garden, by J. J. Davis (pp. 99–160), brief popular accounts are given of some 25 pests and means for combating them.

Report of the official entomologist, T. J. Headlee (*Trans. Kans. State Hort. Soc., 31 (1912), pp. 160–169*).—This report relates to nursery inspection and orchard spraying.

Twenty-seventh report of the state entomologist, 1911, E. P. Felt (*N. Y. State Ed. Dept. Bul. 510, 1912, pp. 198, pls. 27, figs. 6*).—This covers the work on injurious and other insects of New York for the year ended September 30, 1911.

Work with the codling moth at Arlington near Poughkeepsie and at Kinderhook was continued (E. S. R., 26, p. 146). Comparative tests were made of the value of but one spraying just after the blossoms fall and a similar treatment supplemented by a second application about 3 weeks later, namely, about the time when the young larvæ enter the fruit. A third plat received a third application the latter part of July, designed especially to control the second brood, and a fourth plat was given a single application about 3 weeks after the blossoms dropped with a view to testing the relative value of such a treatment.

Even one spraying resulted in obtaining from 98 to 99 per cent of sound fruit each year, while the check trees yielded only 67 and 85 per cent worm-free apples. The data relating to the 3 seasons, 1909 to 1911, have been brought together by the author in tabular form, a summary of which is given in the following table:

Summary of three years' work with the codling moth.

Treatment.	Total fruit.	Clean fruit.		Wormy fruit.					
		Total.	Per cent.	Total.	Per cent.	End wormy.	End and side wormy.	Side wormy.	Per cent end wormy.
Sprayed once	98,855	96,117	97.23	2,738	2.77	279	110	2,349	0.394
Sprayed twice	93,766	91,564	97.65	2,202	2.35	205	84	1,913	.308
Sprayed thrice	69,435	68,897	99.22	538	.78	91	38	409	.185
Sprayed once, late	33,378	25,861	77.47	7,517	22.53	3,093	999	3,425	12.260
Unsprayed	32,984	22,688	68.78	10,296	31.22	4,299	2,611	3,385	20.950

The single spray applied to the different plats during this period gave from 82.08 to 99.26 per cent of sound fruit, the 6 plats receiving 2 sprayings from 83.45 to 99.54 per cent, the plats receiving 3 applications in 1909 and 1911 from 98.99 to 99.54 per cent, and the 3 plats receiving one late application during 1910 and 1911 from 57.35 to 93.57. The check trees during this period varied in individual plats from 28.41 to 85.06 per cent of sound fruit.

These data lead the author to conclude, for the Hudson Valley at least, that in normal years, when the crop is abundant or fairly abundant, one thorough

early spraying within a week or 10 days after the blossoms fall should result in the production of from 95 to 98 per cent of sound fruit, that a slight gain will accrue from a second treatment about 3 weeks later, and an additional gain from a third treatment given the latter part of July. A small crop almost invariably means a larger percentage of wormy fruit and if the prospects are even fair for good prices the third spraying the latter part of July will at least justify itself because of the additional protection from possible severe injury by the second brood.

"There is no reason why the progressive fruit grower should not watch developments and if wormy apples seem to be somewhat common in early July, protect himself against possible further injury by spraying thoroughly the latter part of that month and thus destroy many of the second brood larvæ before they can enter the fruit. This second treatment would hardly be necessary more than once in 3 or 4 years, unless the light crop and high prices justified efforts to produce the largest possible quantity of sound fruit."

Brief summarized accounts, supplemented by bibliographies, are given of the gipsy moth; green fruit worm, which was prevalent in the Hudson Valley and defoliated many of the soft maples at Kingston; the iris borer (*Macronoctua onusta*), a caterpillar which destroyed iris tubers at Saratoga Springs; the notch wing (*Ennomos magnarius*), the caterpillar of which is a somewhat general feeder; maple leaf cutter (*Paraclemensia acerifoliella*), excessively abundant at Bolton; locust leaf miner (*Chalepus dorsalis*), which was the source of serious injury to the foliage of black locust trees at Syosset and Jericho, Long Island; rosy hispa (*C. nervosa*), a leaf-feeding beetle which defoliated many locust trees at Syosset and Jericho; rose leaf-hopper (*Typhlocyba rosæ*), which was exceedingly abundant and injurious to foliage of young apple trees at Ghent, N. Y., in October, 1909; and the periodical cicada. The season of 1911 was marked by the appearance of the large Hudson River brood of the periodical cicada. The first cicada pupa appeared above ground on May 13 and transformed to the adult the next day; the last adult was observed on July 18. The female is said to exercise very little choice in selecting twigs in which to deposit eggs, between 70 to 80 kinds of trees, bushes, and herbaceous shrubs having been recorded as ovipositing material. A single female can make as many as 50 slits in a twig, and after depositing her complement, which is said to be from 400 to 500 eggs, drops to the ground and dies. Oviposition commenced at Nyack in 1911 on June 22, the eggs beginning to hatch within 5 weeks. Records of the occurrence of the cicada in the Hudson Valley, as reported by correspondents, show that it appeared during 1911 on the western end of Long Island, on Staten Island, and in practically all of the counties on each side of the Hudson River from New York City north to Saratoga and Washington Counties, the northernmost limit recorded being at Thomson, Washington County. The English sparrow is thought to be largely responsible for the local extermination of the cicada in the vicinity of cities. The fungus, *Massospora cicadina*, was rather prevalent in a number of localities. Reports received indicate that the damage of the cicada was very severe in localities where the insects were exceptionally numerous. Many of the young twigs and in some instances most of the twigs were killed by the numerous oviposition scars.

A report upon the condition of the shade trees of the city of Mount Vernon, N. Y., next given, is followed by an account of experiments with heat as an insecticide. In the experiments which were made with the oriental cockroach (*Periplaneta orientalis*), they became uneasy when the temperature reached about 112° to 114° F.; they exhibited evident signs of distress at 116° or there-

abouts, and succumbed at a temperature of about 120°. "This is a comparately moderate heat and it would seem entirely practical, in the case of hotel kitchens and similar places where there must of necessity be a good-sized heating plant, to destroy the pest with this rather moderate temperature. In practice it would be unsafe to plan for less than 30 minutes at a temperature of 120° if one would obtain satisfactory results."

Under the heading of Notes for the Year, brief accounts are given of the injurious or interesting species which came to attention during 1911. The pests thus noted are *Hoplia trifasciata*, a beetle which was abundant on the blossoms in a pear orchard in Greece; Say's blister beetle (*Pomphopoea sayi*); red-humped apple caterpillar; forest tent caterpillar; a miner which operated under the skin of the apple; San José scale; raspberry Byturus (*Byturus unicolor*); garden flea (*Smynthurus arvalis*); four-lined leaf bug (*Poecilocapsus lineatus*); spiny elm caterpillar (*Euvanessa antiopa*); elm leaf beetle (*Galerucella luteola*); bronze birch borer (*Agrilus anxius*); white-marked tussock moth; European elm case bearer (*Coleophora limosipennella*); hickory bark borer (*Eccoptogaster quadrispinosus*); two-lined chestnut borer (*A. bilineatus*); *Abia inflata*; June beetles; cecropia moth; cotton moth; *Depressaria atomella*; a species of Gracilaria; sooty Crambus (*Crambus caliginosellus*); lunate onion fly (*Eumerus strigatus*); *Xylophagus lugens*; *Psilocephala melampodia*; and blood worms (*Chironomus* sp.).

A list is given of publications of the entomologist during the year and of additions to the collections from October 17, 1910, to October 15, 1911.

Recent experiments with the codling moth, E. P. Felt (*Jour. Econ. Ent., 5 (1912), No. 2, pp. 153–169*).—These data are included in the report noted above.

The season's experiences with injurious insects, P. J. Parrott (*West. N. Y. Hort. Soc. Proc., 57 (1912), pp. 119–133, figs. 5*).—Particular mention is made of 3 pests, namely, the cherry sawfly leaf-miner (*Profenusa collaris*), which appeared about Geneva in Ontario County, about Schenectady in the Mohawk Valley, and about Germantown in the Hudson River Valley, and was a source of injury to sour cherries; the pear psylla; and pear thrips.

Entomological notes, D. T. Fullaway (*Guam Sta. Rpt. 1911, pp. 26–35, pl. 1*).—This paper is based upon observations and collections made by the author, who was detailed from the Hawaii Federal Station, during a period of some 6 months following his arrival in Guam on May 27, 1911. The insects of economic importance are discussed under the headings of the various fruits, vegetables, etc., attacked. Among the more important pests mentioned are a mealy bug (*Pseudococcus cocotis*), which is the source of considerable injury to the coconut palm; a pyralid moth (*Marasmia trapezalis*), which badly injures smal corn plants; *Aphis maidis*, which attacks Indian and Kafir corn; *Heliothis obsoleta*, which injures corn and tobacco; the rice weevil, which is probably the most serious corn pest; the melon aphis, which attacks the cowpea, watermelon, breadfruit, eggplant, etc.; *P. citri* and *Aonidiella aurantii*, which infest citrus; *P. bromeliæ*, which is very injurious to the pineapple; 2 common sweet potato weevils (*Cylas formicarius* and *Euscepes* [*Cryptorhynchus*] *batatæ*); the beet webworm (*Hymenia fascialis*; the Australian cattle tick (*Margaropus annulatus australis*); the common carabao louse (*Hematopinus tuberculatus*); the common fire ant (*Solenopsis geminata rufa*), which is a menace to cattle and sheep raising through its attacking the mucosæ of newborn animals; the house fly; and 2 species of mosquitoes (*Culex* sp. and *Stegomyia scutellaris*).

As compared with some other tropical regions where the insects have been studied, the island is said, in a general way, to have few injurious insects, thus emphasizing the importance of a strict quarantine of plant introductions. The

lady beetle *Cryptolæmus montrouzieri*, an important enemy of mealy bugs, has already been introduced into the island and attempts are being made to introduce hymenopterous parasites of dungflies from Hawaii.

Report on injurious insects in Finland, 1909, E. REUTER (*Landtbr. Styr. Meddel. [Finland], 1911, No. 78, pp. 29, figs. 2*).—The entomologist here reports upon the occurrence during the year of the more important insect pests.

Destructive forest insects of Dumfriesshire, W. H. WHELLENS (*Trans. and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc., 24 (1911–12), pp. 260–269*).—A brief discussion of the more important forest pests.

Some insect pests of the California live oaks, R. W. DOANE (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 346–348*).—This is a preliminary report in which the author mentions the oak-tree moth (*Phryganidia* sp.), tussock moth, leaf miners, twig girdler, carpenter worm, and the oak-tree Cerococcus as enemies of California live oaks.

Insects destructive to books, W. R. REINICK (*Sci. Amer. Sup., 73 (1912), No. 1897, pp. 292–294, figs. 10*).—Previously noted (E. S. R., 26, p. 354).

The transmission of kala azar by blood-sucking Arthropods, WENYON (*Kala Azar Bul. 1 (1911), No. 1; abs. in Jour. Trop. Med. and Hyg. [London], 15 (1912), No. 3, pp. 44, 45*).—This is a detailed account of the experimental work conducted on the transmission of kala azar by blood-sucking insects.

Termite studies, N. HOLMGREN (*K. Svenska Vetensk. Akad. Handl., 48 (1912), No. 4, pp. 166, pls. 4, figs. 106*).—This third part (E. S. R., 27, p. 357) deals with the family Metatermitidæ.

Stop-back of peach, E. A. BACK and W. J. PRICE, Jr. (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 329–334*).—The authors find that stop-back of peach in Virginia is caused principally by the tarnished plant-bug. This insect is present on peach stock in largest numbers only for a comparatively short time and unless one is present in the nursery when injury is taking place most rapidly it is easily overlooked as the causative agent. Mites in Virginia, presumably *Tarsenomus waitei*, are absent from freshly killed terminal buds, but later may be found in numbers in the blackened decaying tips. In 11 cage experiments carried on in the field, no stop-back developed in any cage from which *Lygus pratensis* was excluded, but all or many shoots developed stop-back in cages into which specimens of this bug had been introduced.

The work in Peru against the white scale of cotton, C. H. T. TOWNSEND (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 256–263*).—The author believes the white scale (*Hemichionaspis minor*) to be of Old World origin, that it long ago spread to America, and like the square-weevil reached northern Peru from the humid coast region of Ecuador, where it occurs on wild cotton at the present time. Like most diaspine coccids this scale if left to itself is able to breed quite continuously under practically all kinds of climatic conditions from cool humid to hot arid, the only requisite being that the host plant shall continue in a condition of normal physiological activity.

The white scale is parasitized by several hymenopterous species, namely, *Aspidiotiphagus citrinus*, *Prospaltella aurantii*, and apparently *P. berlesei*, *Aphelinus fuscipennis*, and 2 or 3 other species of the tropical American genus Signiphora. These parasites are very active during the humid months but unlike the host are unable to continue their activity during the hot dry months of summer. With the aid of other agencies they are able to control the scale by the end of the humid season but during the hot dry months the scales which escape increase rapidly and by the beginning of the humid season are again as abundant as ever. Several introductions of the oriental lady beetle *Chilocorus similis* have been made, but as yet it has not become estab-

lished. Conditions in Peru are said to be such as to make the application of insecticides impractical.

A third brood of codling moth in Kansas in 1911, L. M. PEAIRS (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 243–245*).—Observations made by the author during the summer of 1911 in orchards in northeastern Kansas indicate that there was a third brood which was probably induced by the very unusual weather conditions.

The potato tuber moth (Phthorimæa operculella), E. O. ESSIG (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 6, pp. 203–213, figs. 8; Cal. Cult., 39 (1912), No. 9, pp. 195, 200, 201, figs. 5*).—The potato moth was first discovered in California at Bakersfield in 1891, where it is thought to have been introduced in potatoes from China. It now occurs practically throughout the territory south of Sacramento, along the coast, and in the interior valleys. It has been reported as occurring at Santa Monica, Los Angeles, Bakersfield, Alameda, and in the Salinas, San Joaquin, and lower Sacramento Valleys. It has been taken by the author in large numbers throughout Ventura County.

Some further notes on the wheat-head army worm (Meliana albilinea), R. L. WEBSTER (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 335, 336*).—These supplementary notes (E. S. R., 25, p. 55) relate to parasites of *M. albilinea*, namely, *Pentarthron retorridum*, *Microgaster auripes*, *Microplitis melianæ*, *Mesochorus nigrisignis*, and *Omorgus* sp.

Report on the work with the cochylis and eudemis moths during 1911, P. MARCHAL (*Jour. Off. Répub. Franç., 44 (1912), No. 44, pp. 1461–1464; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1040–1044*).—This is a report submitted to the French minister of agriculture on the work at the temporary station established for the purpose of investigating these pests.

An insect enemy of pasture land and growing alfalfa, E. K. CARNES and E. J. NEWCOMER (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 7, pp. 275–280, figs. 3*).—The crane fly *Tipula simplex* is said to have been the source of considerable injury to young alfalfa in the Sacramento River section of California. The injury is largely to young plants, the roots of the older plants being tough enough to resist the attack. The larvæ appear in January or February after the grass has started well, develop rapidly, and pupate in March. Eggs from 97 to 164 in number, with an average of 130, were found in dissections of 5 freshly emerged females. Dissemination takes place very slowly, due to the inability of the larvæ to travel any distance and the wingless condition of the females.

Control measures consist in a thorough plowing of infested fields, thus destroying the larvæ by starvation. The application of 1 lb. of cyanid of potassium dissolved in 50 gal. of water to the soil will destroy the larvæ, as many as 28 larvæ to the square inch having been counted after its use in badly infested fields.

Poliomyelitis transmitted by the biting fly, Stomoxys calcitrans, M. J. ROSENAU (*Abs. in Pub. Health and Mar. Hosp. Serv. U. S. Pub. Health Rpts., 27 (1912), No. 39, pp. 1593, 1594*).—Six out of 12 monkeys exposed to the bites of a large number of stable flies (*S. calcitrans*), which had been allowed to bite monkeys sick with infantile paralysis in various stages of the disease, became sick with well-marked symptoms of the disease, and of these, 3 died. It is concluded from the experiments that after the virus of poliomyelitis is taken into the body of the fly by biting an infected animal or person some time, probably less than 21 days, must elapse before the fly is capable of transmitting the disease.

[Transmission of poliomyelitis by the stable fly], M. J. ROSENAU (*Abs. in Jour. Amer. Med. Assoc., 59 (1912), No. 14, p. 1314*).—These data have in part been noted in the above account.

[The transmission of poliomyelitis by the stable fly (Stomoxys calcitrans)], M. J. ROSENAU (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 41, p. 1663*).—This relates to the investigations noted above.

Transmission of poliomyelitis by means of the stable fly (Stomoxys calcitrans), J. F. ANDERSON and W. H. FROST (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 43, pp. 1733–1735*).—The authors' experiments here reported confirm those of Rosenau, above noted, and seem to demonstrate conclusively that infantile paralysis may be transmitted to monkeys through the agency of the stable fly. It remains for further work to decide whether this is the usual or the only method of transmission in nature.

The possible etiological relation of certain biting insects to the spread of infantile paralysis, C. T. BRUES and P. A. E. SHEPPARD (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 305–324*).—An abstract of this report, made to the Massachusetts State Board of Health in October, 1911, has been noted (E. S. R., 26, p. 654).

Hippodamia ambigua in Massachusetts, B. N. GATES (*Jour. Econ. Ent., 5 (1912), No. 2, p. 231*).—Some 50 active individuals of this lady beetle are reported at Amherst, Mass., in January from market celery grown in California.

Diabrotica virgifera as a corn rootworm, C. P. GILLETTE (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 364–366, figs. 7*).—This beetle is reported to have been a source of injury through boring in the roots of corn. The author concludes from observations made that the insect is single-brooded and has practically the same life history as *D. longicornis*.

Notes on Saperda calcarata in South Carolina, W. P. GEE (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 336, 337, pl. 1*).—The author reports that some 1,400 ten-year-old Carolina poplars (*Populus deltoides*) at Whitmire, S. C., were found on April 20, 1912, to be so severely infested with *S. calcarata* as to be easily broken off by heavy winds.

Cleonus canescens as a fruit tree pest, C. P. GILLETTE (*Jour. Econ. Ent., 5 (1912), No. 4, p. 367, fig. 1*).—The author states that this beetle has been reported on several occasions to be a pest of young fruit trees on the western slope of the Rocky Mountain Range in Colorado and Utah. Apparently it is a native species and normally feeds upon native food plants. In every instance where the injury was reported, the trees were newly set on virgin soil.

Insects infesting woollen tops, W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 23 (1912), No. 6, pp. 491, 492*).—Woollen tops shipped from mills in New South Wales were found, when opened in Japan, to be infested by the larvæ and pupæ of the red-legged ham beetle (*Necrobia rufipes*), which had made cocoons all over the surface of the bundles in the prepared wool. Investigations showed that the pest must have developed to the full-grown pupæ in some other material and entered the wool to find a suitable place to pupate.

The boll weevil problem, with special reference to means of reducing damage, W. D. HUNTER (*U. S. Dept. Agr., Farmers' Bul. 512, pp. 46, figs. 9*).—This is a revision of Farmers' Bulletin 344, previously noted (E. S. R., 20, p. 853), and which it is intended to supersede. The data have been revised, and certain new matter added, including results of investigations.

The cotton square-weevil of Peru and its parasites, C. H. T. TOWNSEND (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 252–256*).—This is a report of further investigations (E. S. R., 25, p. 763) of the cotton square-weevil, which has been

determined to be *Anthonomus restitus* and originally described from the island of Puná in the Bay of Guayaquil.

The author states that it is practically certain that the square-weevil reached the cotton districts of the Peruvian coast from the humid coast region of Ecuador. His investigations seem to show that this weevil does not inhabit other than the lowlands of the Pacific coast strip. During 1911 the weevil was found to a limited extent in the newly set bolls, just after the dropping of the flower. One hundred and seventy-eight weevils and 18 parasites issued or were extracted from 1,971 newly set bolls collected in July and August. From 20 lots of 4,408 fallen or more or less yellowed hanging squares collected at various points during July and August 2,800 weevils and 573 parasites were obtained; upon examination a total of 2,131 squares were found to contain weevil stages, and practically 17 per cent of the weevil stages in these squares were parasitized. The 591 parasites obtained from the July and August lots are said to represent at least 11 species, all of which are thought to be true parasites of the weevil and 5 to represent new species.

On a collection of parasitic Hymenoptera (chiefly bred), made by Mr. W. W. Froggatt, in New South Wales, with descriptions of new genera and species, I, P. CAMERON (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 2, pp. 333–346*).—Among the 16 species and 1 genus here described as new are *Hymenobosmina verimaculata*, reared from a case moth (*Thyridopteryx hübneri*) at Medowie, and *Opius tryoni*, reared from fruit fly (*Dacus tryoni*), at Narara.

On a collection of parasitic Hymenoptera (chiefly bred) made by Mr. W. W. Froggatt in New South Wales, with descriptions of new genera and species, II, P. CAMERON (*Proc. Linn. Soc. N. S. Wales, 36 (1911), pt. 4, pp. 636–655*).—Two of the species here described as new, namely, *Chalcis pomonæ* and *Anthrocephalus carpocapsæ*, were bred from the codling moth at Glen Innes.

On a collection of parasitic Hymenoptera (chiefly bred) made by Mr. Walter W. Froggatt, in New South Wales, with descriptions of new genera and species, III, P. CAMERON (*Proc. Linn. Soc. N. S. Wales, 37 (1912), pt. 1, pp. 172–216*).—Among the species here described as new that are of economic importance are the ichneumonids *Mesostenus pomonellæ* (reared from the codling moth at Glen Innes), *Gambrus stokesii* (a codling moth parasite), *Amorphota ephestiæ* (parasitic on the Mediterranean flour moth and common in flour mills in Victoria and New South Wales and also known to occur in England), and *Philogalleria sextuberculata* (reared from the bee moth (*Galleria mellonella*) in Victoria); the braconid *Opius euthyrrhini* reared from the palm weevil (*Euthyrrhinus meditabundus*) at Gosford; the cynipid *Heptamerocera lonchææ* reared from the tomato fly (*Lonchæa splendida*); the chalcidids *Anthrocephalus pomonellæ* (reared from the codling moth at Narara), *Aressida annulicornis* (parasitic on *E. meditabundus* at Gosford), *Callinome graminis*, *C. reticulatus*, and *Eupelmis testaceiventris* (all 3 reared from grass seed), *Pteromalus stironotus* (reared from moth pupæ (*Agrotis* sp.) at Hay), and *Marlattiella aleyrodesii* (reared from the saltbush Aleyrodes at Broken Hill). *Lissopimpla semipunctata*, thought to be a parasite of the army worm (*Leucania semipunctata*), seems to have become established in New Zealand where it was introduced from Australia. *Lipolexis rapæ* is said to be a common parasite of the cabbage aphis in Australia.

Cornish sawflies, J. CLARK (*Ann. Rpt. Roy. Cornwall Polytech. Soc., n. ser., 1 (1910), pt. 2, pp. 343–374*).—A report of studies of the Cornish sawflies.

Tobacco extracts, their comparative values as insecticides, W. O. HOLLISTER (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 263–267*).—Experiments conducted to determine whether nicotin is the principal active constituent of tobacco extract or if other ingredients add to its effectiveness as an insecticide lead the author

to conclude that "a solution of pure nicotin is practically as efficient as the products containing a quantity of extractive matter. Nicotin sulphate possesses no advantage over the uncombined product. A solution of pure nicotin possesses the additional advantage of being free from the other constituents of tobacco which are nauseous and injurious."

FOODS—HUMAN NUTRITION.

Foods—their origin, composition, and manufacture, W. TIBBLES (*London, 1912, pp. VIII+950+4*).—The material presented in this digest of data is arranged under the main divisions of chemical constituents of animal and vegetable foods; materia alimentaria from the animal kingdom; materia alimentaria from the vegetable kingdom; condiments and spices; and beverages; each of these being further subdivided into chapters.

As the author points out, "the chemistry of foods is closely bound up with the chemistry of the living organism; to apply the former to the science of dietetics, it is necessary to know the chemistry of living tissues; without a knowledge of the chemistry of the human frame, it is impossible to appreciate the difference in the value of various foods to the body;" and he has therefore thought it necessary "to give an outline of constructive chemistry based on the theory of ions, and also an outline of the chemistry of constituents of the living organism, or what is commonly called 'physiological chemistry.' It is believed that a careful study of these two branches of science, especially by medical men, is essential to a thorough understanding of the subject of foods and feeding, and without such knowledge the student will fail to grasp the fuller meaning of the science of dietetics."

As a whole the volume is a reference handbook presenting in concise form data regarding the origin, characteristics, and manufacture of a large number of foods and beverages.

An index is provided.

Relative economy, composition, and nutritive value of the various cuts of beef, L. D. HALL and A. D. EMMETT (*Illinois Sta. Bul. 158, pp. 133–233, figs. 69*):—In these studies, 3 steers were used, viz, a choice grade Hereford, 18 months old, weighing 902 lbs.; a choice grade Aberdeen-Angus, 24 months old, weighing 1,190 lbs.; and a prime pure-bred Shorthorn, 29 months old, weighing 1,360 lbs.

Comparing the results obtained with each of the 3 cattle in the order in which they are mentioned above, the weights of chilled dressed beef were 60.36 per cent, 60.88 per cent, and 63.97 per cent; of the killing fats were 5.15 per cent, 5.97 per cent, and 4.71 per cent; and of the hides were 7.48 per cent, 6.51 per cent, and 6.43 per cent, respectively, of the live weight. The average yields of straight cuts were loins, 16.76 per cent; ribs, 9.77; rounds, 21.78; chucks, 21.89; plates, 15.63; flanks, 5.15; fore shanks, 4.97; and kidney suet, 4.06.

The lean in straight wholesale cuts varied from one-third in the flank to two-thirds in the chuck; the fat varied from 11 per cent in the shank to 63 per cent in the flank; and the bone varied from nothing in the flank to 40 per cent in the shank. In the hind quarter, 54.42 per cent of lean, 34.55 per cent visible fat, and 10.71 per cent bone were found; in the fore quarter, 59.12 per cent lean, 26.69 per cent visible fat, and 13.73 per cent bone. The sides of beef averaged 57 per cent lean, 30 per cent visible fat, and 12 per cent bone.

Dry substance varied from 37 per cent in the clod to 68 per cent in the flank. Total fat varied from 18 per cent in the clod to 57 per cent in the flank. Protein varied from 9.44 per cent in the flank to 16.98 per cent in the shank. Soluble protein varied from 0.66 per cent to 2.08 per cent and was proportional

to total protein of the various cuts. Organic extractives varied from 0.76 per cent in the flank to 2.06 per cent in the round. Ash varied from 0.40 per cent in the flank to 0.87 per cent in the round, and from 70 to 87 per cent of the total ash was soluble. Phosphorus and total mineral matter were highest in the leaner cuts, phosphorus varying from 0.077 per cent in the flank to 0.184 per cent in the round. Fuel value appears to be a function of fat content, and varied from 235.1 calories per 100 gm. in the clod to 554.9 calories in the flank.

"There seems to be no relation between market prices and the percentages of fat, protein, extractives, and ash. The cheaper cuts appear to be as valuable and in some cases actually more so than the higher-priced cuts from the standpoint of protein and of energy. These statements do not take into account the factors of tenderness nor the influence the degree of fatness may have upon the palatability of cooked meat. In purchasing meat for protein primarily, the neck, shank, and clod are the most economical cuts; the plate, chuck, flank, and round follow; with the rump, rib, and loin as the most expensive. From the standpoint of fuel value, the flank, plate, neck, and shank cuts are the cheapest, while the rib, loin, and round are the most expensive. Considering both factors, protein and fuel value, and along with these the adaptability of the meat for general use the clod, chuck, and plate are the most economical cuts at the retail prices given."

Percentages of lean, visible fat, and of bone in each of the retail cuts were determined. "Of the various steaks, the porterhouse cuts were highest in net cost of edible meat, and chuck steaks lowest. Of the roasts, the first cut of the prime ribs was relatively dearest and the rump cheapest. The most expensive boiling and stewing cuts, in terms of edible meat, were the shoulder pot roast and clod, while the rib ends and brisket cost the most with respect to lean meat alone, and the shank stew and neck were the most economical, either as source of lean or of total meat. Soup bones were exceedingly variable in relative economy, the middle cuts from the shanks being relatively cheapest, and the hock and end of the fore shank most expensive.

"In general, the low-priced cuts were by far the most economical sources both of lean and of total edible meat. It is evident, therefore, that market prices of the various retail cuts of beef are determined chiefly by considerations other than their relative food values."

"The relative efficiency of different types of cattle or systems of production can not be accurately compared without considering the adaptability of the beef to the purpose for which it is used. . . . It is highly essential to the entire beef-cattle industry, on the one hand, and the economic welfare of the beef-eating public, on the other, that a more intelligent understanding of the different cuts of meat be acquired by consumers generally."

The retail cuts are illustrated by numerous photographs.

Loss of fat in drying meat, M. TAMURA (*Biochem. Ztschr., 41 (1912), No. 1, pp. 78–101; abs. in Zentbl. Physiol., 26 (1912), No. 14, p. 604*).—According to the author, there is a larger or a smaller loss of fat when finely ground meat is dried and pulverized, the loss increasing with the amount of dried material. Such a loss is hindered by the presence of alcohol.

The continued action of high temperature also lessens the quantity of fat present.

Meat poisoning, F. A. BAINBRIDGE (*Brit. Food Jour., 14 (1912), Nos. 163, pp. 126–130; 164, pp. 144–146*).—Paratyphoid infection and meat poisoning are compared and the difference in causal organisms, latent period, clinical appearance, habitat of causal bacilli, and mode of infection are noted.

A bacteriological study of shell, frozen, and desiccated eggs; made under laboratory conditions at Washington, D. C., G. W. STILES and C. BATES

(*U. S. Dept. Agr., Bur. Chem. Bul. 158, pp. 36, pls. 3, figs. 2*).—An extended study was made of fresh eggs in the shell of known quality and of frozen and desiccated eggs prepared from different grades of materials and under commercial and laboratory conditions. The eggs examined were purchased either directly from the producers or in the open market and were intended for direct consumption.

The authors discuss the conditions affecting the quality of eggs used for freezing and drying, the grading, breaking, and mixing of eggs, methods of drying eggs, and general sanitary precautions.

Bacteriological data on fresh eggs are reported as well as experiments with frozen egg products and with dried egg products. It is believed that the data reported "will be of special interest and profit to those manufacturing these products, in their endeavors to produce a more acceptable foodstuff, as well as to the bakers, confectioners, etc., by whom they are largely purchased."

The general conclusions which were drawn follow:

"Under normal conditions, strictly fresh eggs contain few if any bacteria, and no appreciable numbers of *B. coli* in 1 cc. quantities.

"Frozen egg products prepared in the laboratory in Washington from second-grade eggs comprising 'undersized,' 'cracks,' 'dirties,' and 'weak eggs' generally show a total bacterial content of less than 1,000,000 organisms per gram, while dried eggs prepared from the same grades usually contain a total bacterial content of less than 4,000,000 organisms per gram, both kinds containing but a very small number of *B. coli;* from a bacteriological standpoint they are considered an edible product.

"Frozen products made from 'light spots,' 'heavy spots,' 'blood rings,' and 'rots' show bacterial counts generally ranging from about 1,000,000 to 1,000,000,000, while dried eggs made from the same grades usually contain from 4,000,000 to more than 1,000,000,000 organisms per gram with a relatively high proportion of *B. coli* and *B. streptococci* in both the frozen and dried material, indicating an unwholesome article, unfit for food, and only useful for tanning leathers, or for other technical purposes.

"While the principle of preserving food by the abstraction of moisture and refrigeration is recognized as a perfectly legitimate business when applied to wholesome products, no amount of freezing and desiccation will rejuvenate eggs already decomposed in whole or in part.

"The experiments herein reported on frozen and dried egg products kept at low temperatures indicate during the early part of storage a general rise in the bacterial content with a subsequent decline in numbers. This decline was more marked in the case of dried eggs containing 10 per cent added sugar than in similar products to which no sugar was added, indicating that the sugar has acted as an antiseptic, as might be expected; such an addition might, therefore, be employed to conceal inferiority. This point, however, must receive further study before it can be safely discussed.

"The egg industry in this country constitutes so valuable a source of food that it is very essential that undesirable practices attending any branch of it be remedied as quickly as possible. Increased care in the production and handling of this highly perishable article on the part of both the producer and the buyer will, to a large extent, bring about these desired conditions."

Fish flesh as food, P. SCHRUMPF (*Ztschr. Phys. u. Diätet. Ther., 15 (1911), Nos. 7, pp. 392–401; 8, pp. 470–480; abs. in Hyg. Rundschau, 22 (1912), No. 20, pp. 1336, 1337*).—The author has studied the loss of material involved in marketing fish and the losses in cooking.

In the case of small fish, it is pointed out that the amount of refuse is larger than the edible portion. When fish is boiled there is usually a small loss of

nitrogenous material, especially in lean fish. In discussing the nutritive value of cooked fish allowance should be made for the butter, flour, etc., which are added to it.

Opened shellfish (*Maine Sta. Off. Insp. 43, pp. 157–164*).—The results of the examination of a number of samples of clams and oysters are reported, the conclusions being essentially the same as those drawn from an earlier and similar study (E. S. R., 25, p. 368).

Soy bean curd, an important oriental food product, H. D. GIBBS and F. AGCAOILI (*Philippine Jour. Sci., Sect. A, 7 (1912), No. 1, pp. 47–54, pl. 1*).—Analyses are reported of soy bean curd (cheese) imported from China in the form of lightly baked cakes. Cakes are also marketed in stone jars covered with a strong salt solution, and an analysis is reported of such cakes and of the liquid.

"No mention of methods of adulteration of this cheap food product has been found in the literature. Upon the local markets it has been discovered that powdered gypsum was mixed with the cheese before baking the cake and also with the liquid before coagulation. In some cases the amounts added were so small that the purpose was evidently not to increase the weight or bulk, but for the coagulation of the curd as previously suggested by other writers, and also, perhaps, for increasing the firmness of the cakes. The salt solution in many of the imported shipments is colored red by means of a wood or by a vegetable dye.

"The local manufacturers are prohibited from using coloring matter or powdered gypsum. Dilute solutions of calcium or magnesium salts are not considered objectionable. Where a binder is desired to give the cakes greater firmness, starch or gelatin is employed."

Soy bean cheese, W. V. LINDER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 12, pp. 897, 898*).—Analyses are reported of materials suspected of being filled cheese, which proved to be soy bean cheese, and of similar soy bean cheese made in the laboratory.

The author states that he found 4.4 per cent sucrose in the soy beans which he used, and suggests that it would be profitable to recover the sucrose from soy beans used for oil making.

The chemistry of honey formation, M. KÜSTENMACHER (*Biochem. Ztschr., 30 (1910), No. 3–4, pp. 237–254, pl. 1, fig. 1; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 3, pp. 107, 108; Jahresber. Untersuch. Nahr. u. Genussmtl., 21 (1911), p. 89*).—According to the author's investigations, in passing sugar once through the honey sac, a bee inverts four-fifths of it.

The acids of honey, A. HEIDUSCHKA (*Apoth. Ztg., 26 (1911), No. 79, pp. 831, 832; abs. in Jahresber. Untersuch. Nahr. u. Genussmtl., 21 (1911), p. 93*).—Formic, lactic, and malic acid were determined, as well as total acid. The presence of tartaric and succinic acid could not be demonstrated.

Official inspections (*Maine Sta. Off. Insp. 41, pp. 101–116*).—The results are given of the examination of a number of samples of jams, jellies, preserves, pork sausage, and pure and imitation vanilla extracts.

Bacteria and ice cream, B. W. HAMMER (*Iowa Sta. Bul. 134, pp. 278–301, figs. 2*).—A study of ice creams conducted with reference to their bacterial content and to accumulate data regarding the value of a bacteriological standard for ice creams led to the following general conclusions:

"At least some Iowa ice cream is in much the same condition bacteriologically as that studied elsewhere. Ten samples taken in Des Moines and representing 5 manufacturers gave an average of 19,920,000 organisms per cubic centimeter; 12 from the college creamery averaged 19,775,000 per cubic centimeter.

"After pasteurization, cream can be stored at 0° C. for several days with no important increase in the number of bacteria developing on agar at 37° C. Unless pasteurized, cream is the greatest source of the bacteria in ice cream.

"Gelatin may carry enormous numbers of bacteria and some samples probably add large numbers of bacteria to the ice cream made with it. The vanilla [used as flavoring] has but little effect on the bacterial contents of ice cream in which it is used. Sugar, properly cared for, is generally low in bacteria. The freezer may be an important source of bacterial contamination of the ice cream made in it.

"It is possible to produce an ice cream with a low bacterial content in quantities up to 20 gal., without employing expensive or time-consuming methods.

"The bacteria which develop on agar at 37° C. do not increase in ice cream during storage, if the product is kept suitably hardened.

"Duplicate bacterial determinations made on ice cream in unbroken containers agree fairly well. With ice cream which has been transferred from one container to another, wide variations may be encountered."

Food—its preparation and distribution at our state institutions (*Ann. Rpt. State Charities Com. Ill., 2 (1911), pp. 52–57*).—This paper discusses the institution food problem on the basis of data gathered particularly in public institutions in Illinois, makes a number of suggestions, and points out the need for exhaustive study of the subject.

[Gas and electricity for cookery], F. S. Toogood et al. (*Jour. Gas. Lighting, 120 (1912), No. 2580, pp. 279, 280*).—This is a summary of data presented to the Society of Medical Officers, London.

Comparative tests of the cost of gas and of electricity in cooking various meats showed that under the experimental conditions electricity was about 4.5 times as costly, and in heating water about 6 times as costly, as gas.

The physiology of protein metabolism, E. P. Cathcart (*New York, Bombay, and Calcutta, 1912, pp. VIII+142*).—In preparing this monograph, which includes data published up to the end of the year 1910, the author states that it has not been his purpose to cover the whole literature of protein metabolism but rather to provide a discussion of the more important results published during the last decade and their bearing upon the work of earlier investigators. "The majority of recent writers have devoted their attention to the study of the metabolism of particular constituents of the protein molecule; an attempt has been made in this monograph to avoid laying undue stress on the fate of these since it is felt that a truer picture of the real course of protein metabolism can thus be drawn."

There are chapters on the following subjects: Digestion and absorption of proteins; protein regeneration; feeding experiments with abiuret products of digestion; deaminization; influence of the food on the composition of the tissues; protein requirements; theories of protein metabolism; starvation; and work, which includes such questions as the influence of work on the output of nitrogen, the difference between voluntary and involuntary muscle contraction, and carbohydrates and fats as protein sparers.

A bibliography and index are provided, and the book as a whole is an important addition to the literature of protein.

On the nutritive value of the products of hydrolysis of proteins, J. Effront (*Monit. Sci., 5. ser., 2 (1912), II, No. 847, pp. 425–443*).—Digestive enzyms act by successive hydration on nitrogenous substances, releasing various compounds of high molecular weight.

Diastases act each on a specific polypeptid. Mineral acids have a similar effect on the polypeptids, except that their action is general, not specific. The products of both enzymic and acidic activity are directly assimilable and have

a high nutritive value. A mixture of amino acids, containing qualitatively and quantitatively all the principal products of complete hydrolysis of proteins, can replace nitrogenous food substances and maintain nitrogen equilibrium. Some of these amino acids are replaceable with others, while others are indispensable. These conclusions result from the experiments of the author and others.

The economic possibilities of the artificial production of food principles are discussed, and a bibliography is given.

Oryzanin, a constituent of rice bran, and its physiological importance, U. SUZUKI, T. SHIMAMURA, and S. ODAKE (*Biochem. Ztschr., 43 (1912), No. 1–2, pp. 89–158, pl. 1, figs. 7*).—The authors have isolated a body from rice bran for which the name "oryzanin" is proposed, which they consider of special importance in animal nutrition. They state that without this substance, protein, fats, carbohydrates, and salts can not fulfill their physiological function.

To the lack of this body is ascribable beriberi, so prevalent where polished rice is the principal article of diet. From data obtained in experiments with animals, the conclusion is reached that small doses of oryzanin are curative. Oryzanin, the authors state, is not limited to rice bran, but occurs in a great variety of foodstuffs.

The etiology of beriberi, H. FRASER and A. T. STANTON (*Jour. Trop. Med. and Hyg. [London], 14 (1911), Nos. 22, pp. 333–341; 23, pp. 349–358; 24, pp. 365–372*).—A large amount of experimental and other data is presented regarding the relation of polished rice to the occurrence of beriberi.

The excretion of water in the breath, G. GALEOTTI (*Biochem. Ztschr., 46 (1912), No. 3–4, pp. 173–185, fig. 1*).—Using a tube provided with suitable valves, water was determined by passing respired air through calcium chlorid.

The author points out that the respired air is not saturated with water vapor. The amount present is influenced somewhat by the respiratory rhythm and by the temperature and moisture of the surrounding air.

Further observations on the effects of muscular exercise in man, F. COOK and M. S. PEMBREY (*Jour. Physiol., 45 (1912), No. 1–2, pp. I, II*).—Respiration, blood pressure, pulse rate, and similar factors were studied with reference to the effects of muscular exercise.

"In the well-trained man there is, after running, a rapid decline in the rate of the pulse and a tendency for it to fall below its original value at rest; in the untrained man the rate remains high and often irregular for some time.

"The internal temperature was raised and sweating occurred when the runner had acquired his second wind."

Changes in chemical equilibrium brought about by motion, F. RÖDER (*Biochem. Ztschr., 40 (1912), No. 3–4, pp. 348–352; abs. in Chem. Zentbl., 1912, II, No. 3, p. 174*).—The author calls attention to the effect of centrifugal force upon chemical systems and the influence of the energy of motion upon chemical energy.

Thermodynamic muscular bioenergy of the living organism, J. LEFÈVRE (*Rev. Gén. Sci., 23 (1912), No. 19, pp. 747–757*).—A mathematical analysis of the relation between the energy utilized in the performance of bodily tasks and the energy simultaneously liberated in the form of heat.

ANIMAL PRODUCTION.

The heating of corn chops, G. S. FRAPS (*Texas Sta. Bul. 152, pp. 3–5*).—The average moisture content of 15 samples of spoiled corn chops examined during the spring of 1912 was 15.15 per cent, and with one exception the samples contained over 13 per cent moisture. It is stated that the spoiling of corn chops is due to the excess of moisture, and that chops containing over 14 per cent

moisture are almost certain to spoil in Texas during the warm months. Corn containing over 10 per cent moisture should be so handled that it can dry out.

Fodder from the cactus (*Pacific Dairy Rev., 16 (1912), No. 26, pp. 1–4, figs. 4*).—A popular article on the value of cactus for milk and meat production.

Studies on feeding, A. B. NYSTROM (*Hoard's Dairyman, 44 (1912), No. 9, pp. 226, 227*).—A discussion of a method of determining feed values based on their net available energy.

The maintenance ration of cattle, H. P. ARMSBY (*Pennsylvania Sta. Rpt. 1911, pp. 602–617, pl. 1*).—A corrected reprint of a bulletin previously noted (E. S. R., 26, p. 167).

A test of the relative values of cotton-seed meal and silage, and cotton-seed meal and cotton-seed hulls for fattening cattle, J. C. BURNS and T. P. METCALFE (*Texas Sta. Bul. 153, pp. 3–14, figs. 4*).—A cooperative feeding test was made during the winter of 1911–12 under actual farm conditions with 40 head of range-bred 3- and 4-year-old grade Shorthorn and Hereford steers. These steers averaged 904 lbs. at the beginning of the experiment. The feeds used were cotton-seed meal, cotton-seed hulls, mixed sorghum and Johnson-grass hay, and silage. The silage was about 75 per cent milo maize, 15 per cent corn, and 10 per cent sorghum. Lot 1, 15 steers, was fed cotton-seed meal and hulls, and lot 2. 25 steers, cotton-seed meal, silage, and, during a part of the experiment, hay. The test lasted 119 days. Cotton-seed meal was fed at the rate of 3 lbs. daily per steer, this amount being gradually increased to 6 lbs. at the end of the first month and to 7 lbs. at the beginning of the third month. It is thought that better results would have been secured if less meal had been fed, but evil effects were noticed only in lot 1. The steers in lot 1 were started on about 20 lbs. of hulls daily which was soon increased to all they desired. Those in lot 2 received about 25 lbs. of silage at the beginning, which was soon increased to about 50 lbs. which was all they would eat. At the end of the first month hay was added to the rations of this lot and about 3 lbs. daily per steer was eaten.

The steers in lot 1 gained 1.98 lbs. each daily at a cost of 10.04 cts. and a consumption of 3.02 lbs. of meal per pound of gain. Those in lot 2 gained 2.03 lbs. each daily at a cost of 7.32 cts. and a consumption of 2.96 lbs. of meal per pound of gain. Preparatory to shipping to Kansas City all the steers were fed liberally for 1 day on corn shucks. The loss in weight during shipping was 84 lbs. each for the steers in lot 1 and 83 lbs. each for the steers in lot 2. The silage-fed steers brought 20 cts. per hundredweight more than the hull-fed steers. There was a net profit of $10.40 a head on the steers in lot 2 as compared with 67 cts. a head on the steers in lot 1. Analyses of all the feeds are given.

Methods of steer feeding, W. A. COCHEL and B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1911, pp. 226–248*).—These experiments deal with the influence of type, value of grain *v.* roughage for winter feeding, comparison of succulent with nonsucculent rations, and a comparison of clover *v.* alfalfa hay for winter feeding.

In the winter of 1910 50 head of 2-year-old grade Aberdeen Angus steers from southern Indiana were fed 112 days. During this period the steers were divided into 5 equal lots and fed as follows: Lot 1, the best heavy steers, and lot 2, the lightest and thinnest steers, 15 lbs. ear corn and 3 lbs. cotton-seed meal per 1,000 lbs. live weight supplemented with mixed hay and corn stover ad libitum; lot 3, ear corn equivalent to the amount of corn in silage fed to lot 4, estimating 5 bu. of corn to a ton of silage, and in addition shredded corn stover and clover hay ad libitum; lot 4, corn silage and clover hay ad libitum; and lot 5, alfalfa hay and corn silage, both being limited to the amount consumed by lot 4.

In continuation of this experiment all the steers except lot 1 were fed for 56 days a ration consisting of a full grain feed of ear corn and cotton-seed meal with corn stover as a roughage during the first 6 weeks, and mixed hay during the last 2 weeks.

The following table gives some of the results obtained, corn being valued at 50 cts. per bushel, cotton-seed meal $30 per ton, stover $3 per ton, silage $2.50 per ton, and hay $12 per ton. Pork made by pigs following the steers and the value of manure are not accounted for.

Comparison of methods of wintering and fattening steers.

	Winter feeding period.				Finishing period.		
	Initial weight per steer.	Daily gain per steer.	Cost per pound of gain.		Initial weight per steer.	Daily gain per steer.	Cost per pound of gain.
	Lbs.	*Lbs.*	*Cts.*		*Lbs.*	*Lbs.*	*Cts.*
Lot 1	976.2	1.97	11.08	Lot 2	996.5	1.76	10.19
Lot 2	738	2.31	7.74	Lot 3	1045.9	1.72	10.15
Lot 3	856.5	1.69	7.89	Lot 4	1029.8	1.52	11.39
Lot 4	859.8	1.52	7.75	Lot 5	1054.8	1.50	11.56
Lot 5	857	1.77	6.88				

"The rate of gains of steers, for a 56-day finishing period, when changed from roughage to a full grain ration for finishing, depended upon similarity of the roughage ration as compared with the full grain ration.

"For feeds fed prior to the finishing period, corn silage proved to be more economical than ear corn and shredded corn stover, when the ear corn fed was equivalent to the corn in the silage.

"Steers fed corn silage prior to the finishing period were in better condition of flesh, but made less gains during the finishing period than those fed on a nonsucculent ration.

"A ration of alfalfa and corn silage proved to be more efficient than one of clover and silage, when followed by a full grain feed during the finishing period."

The yellow Franken breed. ROSSKOPF (*Das gelbe Frankenvieh. Hannover, 1912, pp. 111+196, pgs. 6; abs. in Fühling's Landw. Ztg., 61 (1912), No. 13, p. 463*).—A monograph on the history, characteristics, and economic importance of this short-headed, heavy Bavarian breed of cattle.

Practical facts about Angora goats. W. C. THOMPSON (*Arkansas Sta. Circ. 16, pp. 4*).—A brief summary of available data.

The feeding value of milling offals. F. HONCAMP (*Ztschr. Gesam. Getreidew., 4 (1912), No. 8, pp. 227–233; abs. in Jour. Bd. Agr. [London], 19 (1912), No. 7, p. 579*).—The digestion coefficients found for wheat germ and rye germ are reported in the following table:

Digestion coefficients of wheat germ and rye germ when fed to sheep and swine.

Kind of nutrient.	Wheat germ.		Rye germ.	
	Sheep.	Swine.	Sheep.	Swine.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Dry matter	86.7	84.9	89.1	85.5
Organic matter	89.3	88.9	91.7	89.4
Crude protein	90.8	90.1	94.8	90.8
Nitrogen-free extract	91.4	88.1	94.5	87.8
Crude fat	89.4	85.5	90.3	72.2
Crude fiber	.....	41.3	91.0	67.7

It is stated that the amount of either wheat germ or rye germ which should be given per head per day should not exceed more than 1 lb. for sheep, ¾ lb. for cattle, and ½ lb. for swine. The germ should be fresh in order to avoid rancidity.

Digestion experiments with sheep gave the following digestible nutrients for rye bran and wheat bran:

Digestible nutrients of rye bran and wheat bran.

Kind of feed.	Total organic matter.	Protein.	Fat.	Nitrogen-free extract.	Fiber.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Rye bran:					
Roughly milled	79.0	10.9	2.0	65.8	0.3
Intermediate	76.0	13.4	2.7	57.8	2.1
Completely milled	71.6	15.1	1.5	51.2	3.8
Wheat bran:					
Roughly milled	74.0	14.5	3.5	45.9	6.1
Intermediate	68.0	13.9	3.9	45.2	5.0
Completely milled	60.5	12.4	4.1	40.4	3.6

The amount of bran recommended for fattening animals is from 4½ to 6½ lbs. per head and day for cattle, and from 1½ to 2¼ lbs. for sheep and swine.

The use of fish liver oil as a feed for swine, SUSTMANN (*Mitt. Ver. Deut. Schweinezüchter, 19 (1912), No. 19, pp. 383–387*).—A résumé of experiments in which the oil from the liver of cod and other fish constituted a part of the ration. It is concluded that fish liver oil is not an economical feed for swine and produces an inferior quality of pork, but that it may be used as a tissue builder for animals suffering from malnutrition or other diseases.

Feeding draft horses, W. A. COCHEL (*Pennsylvania Sta. Rpt. 1911, pp. 197–225, pls. 9*).—A report of feeding experiments conducted during the winter of 1910–11 with 21 light draft horses for the purpose of comparing oats with cotton-seed meal and mixed hay with corn silage for fattening purposes. The horses, 17 of which were purchased on the Chicago market and the other 4 taken from the college teams, were from 4 to 8 years old. Percheron and Belgian blood predominating and the type representing what is known on the market as "chunks or light draft horses."

For 2 months previous to the beginning of the experiments the horses were used for classroom exercises in live-stock judging, were allowed to graze on several acres of pasture, and were fed in addition 2 qt. of oats daily and all the hay they desired. On November 3 they were divided into 3 groups of 7 each, as nearly equal in age, size, sex, condition, conformation, temperament, and weight as possible and housed in the basement of an average Pennsylvania barn, tied in single stalls 5 by 8 ft. without exercise except when led about 100 ft. twice daily to water and an equal distance when weighed. Grain was fed three times daily, all horses being started on the same amount of feed, which was gradually increased to full feed for each horse. Groups 2 and 3 received hay morning and evening; group 1, silage in the morning and hay in the evening.

The average gains per head and day were as follows: On corn, cotton-seed meal, corn silage, and mixed hay, 1.59 lbs. at a cost of 13.4 cts. per lb.; on corn, cotton-seed meal, and mixed hay, 1.78 lbs. at a cost of 13.9 cts. per lb.; and on corn, oats, and mixed hay, 1.69 lbs. at a cost of 17.77 cts. per lb. The corn was priced at 50 cts. per bushel, oats 35 cts. per bushel, cotton-seed meal $32 per ton, mixed hay $12 per ton, and silage $2.50 per ton. The increase in

weight was valued at $25 per 100 lbs. Individual weekly records of the amount, kinds, and cost of feeds are presented in tabular form.

"The cost of gains due to individuality of horses in group 1 varied from 9.54 to 19.83 cts.; in group 2, from 10.38 to 19.05 cts.; and in group 3, from 11.53 to 29.63 cts. per pound.

"The rate of gain depends upon the ration used and the temperament, disposition, age, condition, and type of individual.

"The most profitable horse for feeding purposes is one of quiet temperament that shows every evidence of draft blood, with clean, short legs, wide cannons, deep and wide both in chest and in middle, showing constitution and capacity throughout."

Feeding draft horses, W. A. COCHEL (*Pennsylvania Sta. Bul. 117, pp. 3–19, figs. 17*).—This includes a summary of the experiments reported above, and also records of the average lineal measurements of the horses and of the changes in form due to fattening.

"There is little change in depth of body or length of body from fattening, the greatest change being an increase in width and an apparent improvement in the spring of rib.

"The greatest changes in form due to fattening are noted in those parts of the body where the natural covering of muscle is thickest."

The educated horse, LEONHARDT (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 31, pp. 562–566*).—A discussion of the extent to which the intellectual capacity of horses may be developed by proper training, based mainly on the performances of the so-called educated horses. A bibliography on the subject is appended.

An investigation of the intellectual horses of Karl Krall, P. SARASIN (*Zool. Anz., 40 (1912), No. 8–9, pp. 238–255*).—A study of trained horses, in an attempt to explain how such extraordinary results in training animals could be obtained.

Some poultry experiments, T. I. MAIRS (*Pennsylvania Sta. Rpt. 1911, pp. 262–265*).—In an experiment with 200 growing chicks from 1 to 2 weeks old, those fed a wet mash consisting of cracked corn, pin-head oats, shredded wheat waste, and beef scrap grew faster than those fed a dry mash of the same composition. The Plymouth Rocks and Rhode Island Reds made greater gains than Leghorns under the same conditions.

In a crate fattening experiment a lot of 16 chickens averaging 3.31 lbs. each gained 10.75 lbs. on 105 lbs. of a mixture consisting of wheat, bran, corn, chop, and wheat middlings, 3 lbs. each with 1 lb. of beef scrap. Another lot of 16 chickens averaging 2.37 lbs. gained 8 lbs. on 60 lbs. of the same feed; and another lot of 25 chickens, averaging 1.24 lbs. each, made a gain of 13 lbs. on 74 lbs of feed. It is stated that the gain in weight is but a small part of the benefit of crate fattening, the most important being the improvement in the quality of the flesh.

Fattening poultry for market, W. A. COCHEL and H. W. JACKSON (*Pennsylvania Sta. Rpt. 1911, pp. 248–262, pls. 2*).—To ascertain the value of different methods and different feeding stuffs in common use on farms 90 farm-raised cockerels weighing from 3 to 5 lbs. were divided into 9 lots and fed for 1 month. Plymouth Rock blood predominated in about one-half the lot; Rhode Island Red blood in most of the balance. The largest and most profitable gains were secured with a mixture of finely ground, sifted corn meal, buckwheat, and oatmeal mixed with milk. There was practically no difference in gains in crate fattening as compared with pen fattening.

In an experiment with 4 lots of 15 Leghorn cockerels, each averaging 1.22 lbs. in weight, confined to open-front sheds and small yards set with blue grass,

the best lot, fed a ration of 9 lbs. of soaked corn and 1 lb. of meat scrap, gained 12 lbs. in 3 weeks, each pound of gain requiring 3.12 lbs. of feed, at a cost of 3.68 cts. Another lot of 15 Leghorn cockerels of the same average weight, fed equal parts soaked corn and wheat and 12 per cent meat scrap, required 3.3 lbs. of feed to a pound of gain at 3.75 cts. This experiment was repeated in 1911 with practically the same conditions but with slightly heavier cockerels. The most profitable gains, 4.38 lbs. feed per pound of gain, at a cost of 6.58 cts., were made by a ration consisting of corn meal, ground buckwheat, ground oats, and meat scrap.

To test the cost of gains in Leghorn cockerels at different ages 4 lots of 10 each, of different weights, were fed the regular growing ration which consisted of a wet mash in the morning, and noon and evening feeds of mixed grain. The most economical gains, 5.6 lbs. of feed per pound, at a cost of 8 cts. per pound, were made by the lightest lot which weighed 12 lbs. 6 oz. The greatest gains, 9 lbs. 7 oz. in 3 weeks, were made by the lot weighing 19 lbs. 4 oz. This experiment tends to show that up to 2½ lbs. Leghorn cockerels may be produced at a profit. In another experiment with Leghorn cockerels the regular growing ration proved superior to the fattening ration, and little was gained by fattening in close confinement.

Capons for Kansas, W. A. LIPPINCOTT (*Kansas Sta. Circ. 27, pp. 14, figs. 11*).—Brief directions, with illustrations, are given for caponizing.

Hints to poultry raisers, H. M. LAMON (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 206, pp. 5, fig. 1*).—Brief hints are given on the selection of a breed, artificial and natural incubation and brooding, poultry houses and fixtures, feeding, egg production, marketing, lice and mites, and common diseases and their treatment.

The boy fancier: Being a complete manual of all matters appertaining to domestic pets suitable for the youthful fancier, F. T. BARTON (*London and New York, 1912, pp. XX+435; rev. in Nature* [*London*], *88* (*1912*), *No. 2204, p. 411*).—A treatise on the care and feeding of dogs, cats, goats, guinea pigs, rabbits, squirrels, poultry, pigeons, cage birds, and other animals that are often kept as pets and laboratory animals.

Observations on the period of gestation in white mice, J. F. DANIEL (*Jour. Expt. Zool., 9* (*1910*), *No. 4, pp. 865–870*).—The author found that the period of pregnancy in the case of white mice was appreciably longer in lactating than in nonsuckling females.

Growth, variability, and correlation in young trout, J. W. JENKINSON (*Biometrika, 8* (*1912*), *No. 3–4, pp. 444–455*).—A brief discussion of growth in the animal organism, including work previously noted, together with a study of growth in trout. This animal was selected for further study because of certain features which are supposed to be characteristic of growth in general, and a large number of parts could be readily measured. Measurements and correlation coefficients are presented in tabular form.

The voluntary production of feminine characteristics in male mammals, E. STEINACH (*Pflüger's Arch. Physiol., 144* (*1912*), *No. 3–4, pp. 71–108, pls. 6*).—A report of experiments in transplanting ovaries of guinea pigs and rabbits to castrated males. The growth of mammæ was stimulated and other feminine characteristics were produced.

The symbolic statement of relationships, A. E. BOSTWICK (*Science, n. ser., 36* (*1912*), *No. 930, pp. 559, 560*).—The author suggests the use of the ratio sign to indicate the relationship between individuals. Thus, the relationship of parent to offspring would be 1 : 2; of offspring to parent 2 : 1; of grandparent to grandchild 1 : 3; and of grandchild to grandparent 3 : 1.

DAIRY FARMING—DAIRYING.

A study of the relative production and economy of concentrated and bulky rations, H. E. VAN NORMAN and A. A. BORLAND (*Pennsylvania Sta. Rpt. 1911, pp. 268–307*).—As a result of 3 years' work with 24 dairy cows testing bulky rations *v.* concentrated rations, the average cost of total nutrients per pound of milk was 1.24 cts. in the group fed the bulky rations, and 1.15 cts. in the group fed the concentrated rations. The 2 groups were given the same feeds and containing practically the same amount of digestible nutrients, but varied in proportion. Some of the conclusions drawn are as follows:

"The advisability of using a large amount of roughage in the ration will depend largely upon the market prices of grain and roughage. For milk production 1 lb. of total nutrients in grain was worth 3.47 lbs. total nutrients in roughage.

"While the bulky ration was cheaper pound for pound than the concentrated, yet group B consumed a smaller total amount of feed so that the actual cost of feed at market prices was 9.2 per cent less for the group receiving the concentrated ration.

"The net profit, counting butter fat at 40 cts. per pound and feed at market prices, was 16.9 per cent greater for group B receiving concentrated ration. . . .

"While there was variation in degree, yet the same general results were obtained each year as to cost of total nutrients per 100 lbs. of milk and value of nutrients in grain as compared with those in roughage. . . .

"While there was little difference in the relative weights of the 2 groups, the one receiving the bulky ration gained slightly more in live weight than the group receiving the concentrated ration. . . .

"The number of days dry averaged 5.7 per cent less for the cows in the group receiving the concentrated ration."

Balanced v. unbalanced rations for dairy cows, W. J. FRASER and C. C. HAYDEN (*Illinois Sta. Bul. 159, pp. 237–246, figs. 2*).—This is a demonstration of the difference in value of a balanced and unbalanced ration.

Nine cows fed for 131 days a nutritive ratio of 1:6 consumed 50.83 lbs. of digestible matter per 100 lbs. of milk. A similar lot fed a nutritive ratio of 1:11 required 68.14 lbs. of digestible matter per 100 lbs. of milk produced. The total amount of milk produced for the 2 herds was 39,393 and 26,839.8 lbs. of milk, respectively. The first lot consumed 15.79 lbs., and the second lot 19.92 lbs. of total digestible nutrients per pound of milk fat produced. The rations consisted of corn silage, clover hay, and ground corn supplemented by gluten fed in the narrow ration and timothy hay in the wide ration.

"Because of the lack of protein in the ration fed lot 2, the other nutrients were not used to the best advantage. This shows in a striking manner that an excess of carbohydrates can not be made to take the place of a deficiency of protein."

Investigation in the feeding of coconut cake to milch cows, S. SKELTON (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 45–54*).—When coconut cake replaced other concentrated feeds the quantity of milk was slightly decreased, but the percentage of fat was a trifle higher and the butter was somewhat firmer than that made from milk produced in the ordinary feeding periods.

[Dried beet pulp for dairy cows], J. MACKINTOSH (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 38–44*).—Beet chips dried by the Steffen process, when given to milch cows at the rate of from 8 to 10 lbs. per day to replace part of the mangel ration, increased slightly the yield of milk. The quality of the milk and the butter produced was unaffected.

The influence of feeding stuffs upon secretion of milk and fat production in cows, N. HANSSON (*Fühling's Landw. Ztg., 61 (1912), No. 10, pp. 337–351; Jahrb. Deut. Landw. Gesell., 27 (1912), No. 1, pp. 46–59*).—A summary of feeding tests which have been reported from other sources.

The author concludes that the specific effect of any feed varies according to the kind of animal, composition of the ration, and other factors so that the relative value of any feed can not be definitely expressed. Some feeds like palm-nut cake, coconut cake, cotton-seed cake, linseed cake, pea and bean meal, and sugar-beet leaves and tops tend to increase milk secretion and fat content, whereas other feeds like sesame cake, soy-bean cake, maize, roots, and sugar-beet chips have a favorable effect on milk secretion but tend to lower the fat content to a slight extent.

An experimental investigation of the mechanism of milk secretion, with special reference to the action of animal extracts, K. MACKENZIE (*Quart. Jour. Expt. Physiol., 4 (1911), No. 4, pp. 305–330, figs. 16; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 592, II, p. 184*).—A further report along lines previously noted (E. S. R., 25, p. 680). The following conclusions are drawn by the author:

"The mammary gland is, as regards its secretory activity, not under the direct influence of the nervous system. Agents which cause its activity and also those which produce inhibition of its action reach it by means of the blood stream. The organs of the body which produce hormones possessing the power of stimulating the mammary gland to activity are (a) pituitary body, (b) corpus luteum, (c) pineal body, (d) involuting uterus, (e) the lactating mammary gland itself. The pituitary body is in this respect the most powerful. Its active galactagogue substance is formed in the posterior lobe of the gland, and is not specific to mammals, being present also in the pituitary gland of the bird. Hormones inhibitory of mammary secretion are produced by the fetus and placenta.

"Drugs such as pilocarpin, which cause marked activity of most other glandular organs, and others, such as atropin, which inhibit the secretion of most glands, have no effect upon the secretion of the mammary gland. Since the action of these drugs in promoting or arresting secretion of ordinary glands is in all probability exerted through nerves which are distributed to the secreting cells, it is concluded that there are no such nerves in the mammary gland. This conclusion is supported by the fact that neither section of the nerve trunks supplied to this gland nor their faradic stimulation appears to have any influence on the secretion of milk."

Influence of the temperature of drinking water on cows, E. GAVILLET (*Terre Vaud., 4 (1912), No. 4, pp. 46, 47; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 969, 970*).—A method of heating drinking water for cows is described. It is claimed that in a large dairy the increase in the yield of milk was 49 gal. per cow per year since a plant has been installed for heating drinking water.

Records of a dairy herd for 5 years, J. M. TRUEMAN (*Connecticut Storrs Sta. Bul. 73, pp. 125–148, figs. 4*).—This bulletin contains the individual records of the college herd for the past 5 years, as well as the details of handling and the rations fed.

The actual cost of milk production in the herd, which consisted of Jerseys, Guernseys, Holsteins, Ayrshires, and grades, for the past 5 years was estimated at 4.5 cts. per quart, not counting the skill and knowledge contributed by the manager of the herd. Estimating the price of milk at 4 cts. per quart, there was a loss except in the case of a few cows that were extra good producers,

but it is stated that these can not be secured in enough numbers to make a herd of any size.

"Figuring the milk at 5 cts. per quart at the farmer's dairy house gave a net profit every year but one. Figuring the butter at 30 cts. per pound at the dairy gave a net loss every year. It required $65 on the average above cost of feed to maintain each cow one year. The value of the manure at the barn from 1 cow for 1 year is not more than one-sixth as much as the cost of her maintenance above cost of feed. Increasing the average yield of the herd does not greatly reduce the cost of milk production. Although better yields are obtained as a result of improving stock, increase in feed, and more skillful management, these together cost enough to make it impossible for us to produce milk at a profit for 4 cts. per quart even with a good herd."

Official records of pure-bred dairy cows, C. C. HAYDEN (*Illinois Sta. Bul. 160, pp. 249–276, figs. 7*).—This bulletin discusses the destruction of the progeny from the best cows, the improvement of cattle by careful selection and breeding, the value of carefully kept records in breeding operations, and gives semi-official and official records completed in the State up to September 1, 1911, together with some methods followed in official tests. The constitution and by-laws of a local breeders' association are included.

Milk and cream contests: How to conduct them and how to prepare samples for competition, E. KELLY (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 205, pp. 28*).—This circular is intended to replace Circular 151 (E. S. R., 22, p. 77), in order to bring this work up to date. The principal topics discussed are the methods of conducting the contest and scoring exhibits, with suggestions for the production of contest milk with special reference to bacterial content, flavor and odor, visible dirt, solids, acidity, bottle, and cap.

Market dairying and milk products, J. MICHELS (*Wauwatosa, Wis., 1912, 2. ed., rev. and enl., pp. 372, figs. 74*).—This treats of the various problems connected with market milk, including side lines such as modified milk, ice cream, butter, and cheese. The work is adapted for class instruction as well as for the use of the practical dairyman.

A modern dairy in the industrial district of Upper Silesia, F. MEYERS (*Deut. Landw. Presse, 39 (1912), Nos. 50, pp. 584–586; 51, pp. 598, 599; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1847, 1848*).—This describes the equipment, methods of management, and prices received for milk on a modern dairy farm.

Kuchler's patent hygienic system for distributing milk, ZEEB (*Deut. Schlacht u. Viehhof Ztg., 12 (1912), No. 8, pp. 112, 113; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, p. 1016*).—A description is given of a form of milk cart which is now used in Munich because it prevents the milk from being adulterated after it is put in the cans, keeps the cream from rising to the surface when the milk stands for some time, and avoids contamination when the milk is poured out.

"To each can is attached a strong, officially graduated, glass for measuring out the milk. The buyer's milk jug is placed under this apparatus on a movable plate, which when not in use is pressed against the former by a spring. Therefore, before a jug can be placed on it, it must be pressed downwards. This is affected by a lever which is connected with a stirrer inside the can. The milk is thus thoroughly stirred up, before any of it can be drawn. The plate with the jug on it is then pressed upwards by the spring against a second plate, which is fastened to the bottom of the graduated glass, and in the middle of which is the opening for letting out the milk."

The relation between milk constituents and the whey obtained from the same, HÖFT (*Molk. Ztg. [Hildesheim], 26 (1912), No. 66, pp. 1240, 1241*).—The

specific gravity, fat, and solids-not-fat are reported in milks of unlike composition, and their relation discussed as a basis for estimating the cheese yield from whole and skim milk.

The action of rennet on milk, M. NIERENSTEIN and JESSIE STUBBS (*Jour. Agr. Sci., 4 (1912), No. 4, pp. 371–375*).—A study of the factors concerned in the retardation of the coagulation of Cheddar cheese led to the following conclusions:

"The acidity of milk is not due entirely to lactic acid, but partly to some product produced from caseinogen. Pure lactic acid can not be used as a starter, though it stimulates the production of acid from caseinogen. The retardation of the time of coagulation with rennet is not entirely dependent on the calcium salts."

Laboratory studies of rennin, A. ZIMMERMANN (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 506–508*).—Tests of different kinds of rennet indicated that permanency in solution was dependent upon phosphoric acid. The granular scale and sodium sulphate product react for phosphoric acid, differing in this respect from the sodium chlorid product. A glycerol solution 12 months old, prepared from sodium chlorid precipitated rennet, required from 3 to 3½ hours to curdle 18-hour milk. The same milk was curdled in 1 minute when accelerated by the addition of phosphoric acid. Aqueous solutions of rennin of the density of 1.01, containing 0.2 per cent per volume of hydrochloric acid, lost 30 per cent of their activity in 1 day at a temperature of 70° F. More concentrated solutions of a density of 1.09 per cent, containing 1.3 per cent by volume hydrochloric acid, were more permanent. Elevation of temperature caused more rapid destruction. The denser the solution the slower the destruction at an elevated temperature. If rennin is standardized to 1:30,000 in 8 minutes, its use as a control with the rennin to be assayed readily shows whether the milk is fast or slow.

The results of these investigations indicate that acidity to within a limited degree influences the more rapid curdling of milk by rennin, but whether the increased acidity is directly of bacterial origin, or due to a change in the acidity of the phosphate, is still undetermined. The use of granular scale rennin and of phosphoric acid is suggested in place of lactic acid in the preparation of essence of pepsin.

References are given to other work on this topic.

Making yoghourt from milk in Levant, W. H. GALE (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 250, p. 423*).—A method of making yoghourt in Greece, which is said to have been used ever since the Turkish occupation, is as follows:

"Take 5 okes (nearly 1.7 gal.) of fresh cow's milk or sheep's milk and heat it to a temperature of 120 or 110° C. If cow's milk be used the temperature should be 120°; if sheep's milk, 110°. Allow the milk to boil 5 to 10 minutes, according to how thick the yoghourt is desired (as usually prepared it is about the consistency of clabber). Then let the milk cool to a temperature which will permit of a finger being dipped and held in it long enough for one to count slowly from 1 to 20. Pour the milk into small jars or cups and place these in the 'dryer' (a wooden structure in which an even temperature of 30 to 35° can be maintained by a charcoal fire and which can be closed tightly so as to exclude all air). Take a small quantity of old yoghourt saved from a previous supply, say 1 drammion (about 50 grains) for every 5 okes of milk, which may be either of the consistency of cheese or quite hard and dry, and dissolve it in a little water. Introduce a drop of the yoghourt solution into each jar or cup of milk by carefully raising the scum formed on the surface at the edge so as not to break the scum or disturb it more than is absolutely necessary. Close the

doors of the 'dryer,' keep the temperature at 30 to 35°, and leave the jars or cups undisturbed for 3½ hours in summer to 5 hours in winter. The yoghourt will then be ready for use and should be kept in a cool place."

The butter and cheese industry in the Netherlands, M. J. BORBEMANS (*Lait. et Élevage, 7 (1912), Nos. 7–8, pp. 64–67; 9–10, pp. 75–79; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1850, 1851*).—This is a statistical and general account relating to the production and export of butter and cheese in Holland.

Eighteenth annual review of the imported dairy produce trade for the year ended June 30, 1912 (*Weddel and Co. Ann. Rev. Imported Dairy Produce, 18 (1912), pp. 11, pl. 1*).—This is the usual annual review, containing statistics of imports and prices of butter and cheese in the United Kingdom.

Annual report of the activities of the dairy bacteriological laboratory at Dorpat for 1911, C. HAPPICH (*Otchet Moloch. Khoz. Bakt. Lab. Dorpat (Ber. Milchbakt. Lab.), 1911, pp. 81–96*).—This gives the results of the inspection of milk and milk products. The average analysis of 191 samples of butter was as follows: Water, range 9.3 to 19.8, average 13.6 per cent; salt, range 0.3 to 3.7, average 0.8 per cent; acidity, range 0.7 to 6.1, average 2 per cent; Reichert-Meissl number, range 19.4 to 32.4, average 26.3; saponification number, range 216.3 to 235, average 226.7; Crismer number, range 49 to 63, average 55.5.

Report of the activities of the experiment station and dairy school at Königsberg, HITTCHER (*Ber. Vers. Stat. u. Lehranst. Molkw. Königsb., 1911–12, pp. 15*).—Analyses of milk, skim milk, and cream are reported, in addition to a brief account of the general work of the station.

Bulletin of the International Federation of Dairying (*Bul. Féd. Internat. Lait., 1912, No. 6, pp. 69*).—This contains the organization of the International Federation of Dairying, the record of the proceedings of the meeting in Amsterdam in 1910 and in Stockholm in 1911, and other matters relating to the affairs of the association.

VETERINARY MEDICINE.

Results of research in the general pathology and pathologic anatomy of man and animals, edited by O. LUBARSCH and R. OSTERTAG (*Ergeb. Allg. Path. Mensch. u. Tiere, 16 (1912), pt. 1, pp. VIII+711*).—This work, in continuation of that previously noted (E. S. R., 27, p. 576), deals with general etiology (pp. 1–453) and special pathological anatomy (pp. 454–677).

Annual report on progress in the study of the pathogenic micro-organisms, P. VON BAUMGARTEN and F. TANGL (*Jahresber. Path. Mikroorgan., 23 (1907). [pub. 1909], pp. XII+940*).—This volume presents a review of investigations reported during 1907, of the pathogenic bacteria, fungi, and protozoa and is in continuation of the work previously noted (E. S. R., 20, p. 984). As in previous volumes a bibliography is given with each division, and complete author and subject indexes are appended.

Annual report on progress in the study of the pathogenic micro-organisms, P. VON BAUMGARTEN and W. DIBBELT (*Jahresber. Path. Mikroorgan., 24 (1908), [pub. 1911], pp. XII+1136; 25 (1909), [pub. 1912], pp. XII+1159*).—These volumes are in continuation of the work above noted and deal with the literature issued during the years 1908 and 1909, in a similar manner.

Report of the veterinary surgeon to the corporation of the city of Glasgow for 1911, A. M. TROTTER (*Rpt. Vet. Surg. Glasgow, 1911, pp. 34*).—This annual report deals with the occurrence of diseases during the year, meat and milk inspection, etc.

On the hemolysins produced by pathogenic streptococci, and on the existence of antihemolysin in the sera of normal and immunized animals, J. W. M'Leod (*Jour. Path. and Bact., 16 (1912), No. 3, pp. 321–350; abs. in Zentbl. Expt. Med., 1 (1912), No. 14, p. 646*).—Certain strains of streptococci when cultivated in 15 per cent horse serum bouillon, with an alkaline reaction, yield filtrates (Maason or Doulton filters), which are hemolytic. The amount of hemolysin produced by streptococci depends very much upon the nature of the culture media. Streptolysin is destroyed if it is heated for 30 minutes at a temperature of from 50 to 55° C. and in this respect corresponds to tetanolysin, staphylolysin and megatheriolysin. It is rapidly destroyed at a temperature of 37° C. and no hemolysoid is produced by artificial or natural attenuation.

In man, horse, rabbit, and guinea pig only a slight difference in strength of the antihemolysins was noted among the various individuals of the same species. The serum from rabbits and guinea pigs which received large doses of streptolysin for a period ranging from 7 to 8 weeks contained no traces of immune antihemolysin. This was also found to be the case with a man who had gone through a course of streptococcic infection. It was, however, found that virulence and hemolysis were closely related in the pathogenic streptococci.

The cultivation of malarial plasmodia (Plasmodium vivax and Plasmodium falciparum) in vitro, C. C. Bass and F. M. Johns (*Jour. Expt. Med., 16 (1912), No. 4, pp. 567–579*).—The authors present details of investigations in which the asexual cycle of *P. vivax* and *P. falciparum* has been cultivated in vitro in human blood. The parasites were also grown in red blood cells in the presence of Locke's solution, free of calcium chlorid and in the presence of ascitic fluid.

"The parasites grow within red blood cells and there is no evidence that they can be grown outside of these cells. The parasites are destroyed in a very few minutes in vitro by normal human serum or by all modifications of serum that we have tested. This fact, together with numerous observations of parasites in all stages of growth apparently within red cells, renders untenable the idea of extracorpuscular development. Leucocytes phagocytize and destroy malarial plasmodia growing in vitro only when the parasites escape from their red blood cell capsule or when the latter is perforated or becomes permeable. Successive generations of *P. vivax* and *P. falciparum* have been cultivated in vitro by removing the leucocytes from the culture and by transplanting to fresh red blood cells and serum at proper intervals.

"The asexual cycle of *P. vivax* and *P. falciparum* cultivated in vitro does not differ from the same cycle growing in vivo. The sexual cycle has not been cultivated, though we have obtained some evidence of the possibility of its accomplishment. There can no longer be any doubt that *P. vivax* and *P. falciparum* are separate and distinct species. When grown in an identical culture medium and under exactly the same conditions they remain distinct."

Forms suggesting parthenogenesis have been observed.

The agglutination and complement fixation reactions in animals experimentally inoculated with Johne's bacillus, with special reference to the relation of this bacillus to the other acid-fast bacilli, C. C. Twort (*Centbl. Bakt. [etc.], 1. Abt., Orig., 66 (1912), No. 2–4, pp. 316–320*).—The preparation of a specific agglutination and amboceptor for Johne's bacillus can be accomplished by vaccinating rabbits and birds with an emulsion of Johne's bacilli. The presence of the bacteria can only be noted in bovines which were treated with the organism and those which have succumbed to natural infections.

Agglutination could best be obtained in birds, but, on the other hand, rabbits were better suited for specific amboceptor production. Little difference was noted whether Johne's bacillus, *Bacillus phlei*, or the avian bacillus was em-

ployed for these purposes. With the agglutination or complement fixation reaction Johne's bacillus shows no greater relationship to the avian tubercle bacillus than to the other members of the tuberculosis group.

Susceptibility of animals to pneumonic plague, R. P. STRONG and O. TEAGUE (*Philippine Jour. Sci., Sect. B*, 7 (*1912*), *No. 3, pp. 223–228*).—Pneumonic cultures, isolated during the Manchurian epidemic, have been found to be particularly pathogenic for mice, rats, guinea pigs, and monkeys (*Cynomolgus philippinensis*), these animals dying from the same doses and succumbing within the same period after inoculation as has been observed after infection with bubonic strains. The authors' experiments show for the first time that the cutaneous and subcutaneous infection of the tarbagan (*Arctomys bobac*) with virulent cultures of the pneumonic strain gives rise in these animals either to an acute bubonic or to subacute and chronic forms of plague infection. It is also shown that the tarbagan is also susceptible to primary pneumonic plague when infection has taken place by inhalation. Further it is shown that another species of marmot (*Spermophilus citillus*), very common about Mukden and the vicinity, is susceptible to acute plague infection, these animals dying in from 3 to 7 days after cutaneous or subcutaneous inoculation of small doses of the pneumonic strain and exhibiting at necropsy hemorrhages about the point of inoculation, typical buboes, and acute, splenic tumor.

The authors were entirely unable to infect donkeys even when they were made to inhale air charged with the most virulent cultures of pneumonic strains of the plague bacillus for a period of as long as 5 minutes at a time. "Our experiments upon dogs show that these animals are only moderately susceptible to pneumonic plague, but that, when exposed to severe infection, they may contract primary pneumonic plague and die of the disease."

The schizogony of Trypanosoma evansi in the spleen of the vertebrate host, E. L. WALKER (*Philippine Jour. Sci., Sect. B*, 7 (*1912*), *No. 1, pp. 53–62, pl. 1*).—"In the developmental cycle of *T. evansi* a schizogony takes place in the spleen of the vertebrate host. The observations of Salvin-Moore and Breinl, Fantham, and Buchanan that forms similar to the young schizonts of *T. evansi* occur in the internal organs of animals infected with *T. gambiense*, *T. rhodesiense*, and *T. brucei* make it probable that schizogony is a reproductive process common to the trypanosomata. The validity of Schizotrypanum Chagas as a genus distinct from Trypanosoma Gruby appears to be doubtful.

"Further investigation is necessary to determine the significance of this schizogony in the life cycle of the trypanosomata and its relation, if any, to latency in trypanosomiasis and to relapses after chemotherapeutic treatment."

About a case of cutaneous tuberculosis in man, G. COSCO, B. ROSA, and C. DE BENEDICTIS (*Centbl. Bakt. [etc.], 1. Abt., Orig., 66* (*1912*), *No. 2–4, pp. 161–168*).—This is a description of a case of skin tuberculosis which occurred on the left thumb of a veterinary inspector who was engaged in examining the organs of tuberculous animals, and which resulted from cutting the skin slightly at the interphalangeal joint with the autopsy knife. The infection remained localized, and after going through the regular pathological process twice, left nothing but a scar. A bacteriological investigation proved that the bovine type of bacillus was the causative factor. The bacillus of bovine tuberculosis, it is shown, can remain in the body of man for a period of 3½ months and still be very virulent for bovines.

Immunity to tuberculosis and immuno-therapy, E. LESCHKE (*Internat. Centbl. Gesam. Tuberkulose Forsch., 6* (*1912*), *Nos. 10, pp. 499–521; 11, pp. 562–576*).—This is a review of work done in regard to immunity and experimental immunizing against tuberculosis, antibody formation, and protective vaccination against bovine tuberculosis. A bibliography is appended.

A disease of Ascaris megalocephala, WEINBERG and Mlle. KEILIN (*Compt. Rend. Soc. Biol. [Paris], 73 (1912), No. 28, pp. 260–262, fig. 1*).—During the course of investigations of *A. megalocephala* the authors found very pronounced cutaneous lesions on many of these parasites, which do not appear to have been previously observed. They appear as hard, yellowish transverse plaques situated chiefly on the anterior third of the ascarids. This condition was observed nearly every day during the course of close examinations made at the hippophagic abattoir. In 10 lots of 196 ascarids, 130 were diseased.

A contribution to the study of nodular helminthiasis, intestinal and glandular, E. GRIMALDI (*Hyg. Viande et Lait, 6 (1912), No. 11, pp. 596–610*).—Investigations made by the author of a large number of cattle at the municipal abattoirs in Genoa led to the following conclusions:

The nodular helminthiasis of bovines is due to an esophagostome larva. The larvæ leave the nodules and pass into the intestine during the months of June and July. Contrary to the reports of several authors the mesenteric lymph glands may very frequently be included in the infestation and simulate a form of tuberculosis.

Some observations on the ox-warble from the cattle-raising standpoint, H. DES GAYETS and C. VANEY (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 1, pp. 42–45*).—Since in the region about Lyon oviposition occurs from the middle of July to the end of August only, animals turned out to pasture during September and October have no chance to become infested. The authors' records in Forez show an infestation of 52 per cent for animals of from 1 to 2 years of age and but 4 per cent for animals of those from 3 to 10 years of age. It has been found that a great abundance of larvæ may affect the nutrition of the host, which the authors think is not to be wondered at since as many as a score of larvæ in the young stages may be found in a single esophagus. Attention is called to the fact that De Vries in the previously noted work (E. S. R., 27, p. 289) has even observed a case of stenosis of the esophagus due to the large number of larvæ. The possible entrance of anthrax bacilli at the points of perforation of the skin is briefly considered.

The tick problem in South Africa, W. MOORE (*Jour. Econ. Ent., 5 (1912), No. 5, pp. 377–384, figs. 1*).—This is a general discussion of the subject.

Directions for constructing vats and dipping cattle to destroy ticks, H. W. GRAYBILL and W. P. ELLENBERGER (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 207, pp. 20, figs. 2*).—A revision of Circular 183, previously noted (E. S. R., 26, p. 382).

A portable spraying apparatus for ticks and parasites on cattle and a portable bath for foot-and-mouth disease, F. S. H. BALDERY (*Agr. Jour. India, 7 (1912), No. 4, pp. 383–386, pls. 2, figs. 4*).—These forms of apparatus are described and illustrated.

Preparation of pure cultures of the bacillus causing the specific chronic intestinal inflammation in bovines (paratuberculosis), H. HOLTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 5, pp. 378–387, fig. 6; abs in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 1, pp. 396, 397*).—A description is given of the method utilized in preparing pure cultures of this bacillus, which was obtained from the mesenteric lymph nodes of a Jersey cow affected with paratuberculosis. Some infection tests (intravenous and feeding) were made with the acid-fast organism and guinea pigs and rabbits. The results obtained were negative.

In addition to this some tests were made with calves in which the organism was injected either intravenously or subcutaneously, the detailed report of which is to be reported later. When old tuberculin or a tuberculin prepared from the peratubercle bacillus was injected in these animals a marked reaction

was produced. It was also noted that guinea pigs could be made slightly resistant toward tuberculosis by injecting the paratubercle bacillus.

A form of redwater in cattle, due to improper diet, J. G. CLAYTON (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 3, pp. 249–251*).—Redwater in New Zealand is said to be a dietetic and parturient condition, due to a disturbance of the digestive and assimilative processes and leading to an alteration or depravity of the constituents of the blood and their partial destruction. It occurs generally at the end of winter and the beginning of spring, and if taken in time the animals generally recover quickly. "It is frequently seen when animals are feeding on poor low-lying pastures, but the majority of cases occur when cattle, especially pregnant cows, are fed almost wholly on turnips without either getting a run-off or receiving something in the way of dry food, such as oaten chaff, hay, etc."

Onchocerca bovis in Madagascan cattle, M. PIETTRE (*Hyg. Viande et Lait. 6 (1912), No. 7, pp. 380–382*).—The discovery of this parasite, previously described from France (E. S. R., 27, p. 83), in the external and internal femoro-tibial ligaments of a bovine from Madagascar and of a parasite of this genus in the internal femoro-tibial ligament of a deer in France is reported.

The first stages of Dictyocaulus filaria, M. NEVEU-LEMAIRE (*Bul. Soc. Zool. France, 37 (1912), No. 7, pp. 238–241, fig. 1*).—The author finds that the embryos of *D. (Stronglyus) filaria*, which are spread in nature in the excrement of infested sheep, pass their first molt and arrive at the second stage, indistinguishably in water, humid soil, or the body of the earthworm. He finds that the earthworm is not an intermediate host but simply an accidental host in which the embryos develop the same as in the soil. He does not wish to say, however, that this nematode has no intermediate host.

"La Mancha" (La Tache) of ovines: Ovine toxinæmia due to the bacillus of Preisz-Nocard, F. SIVORI (*Rev. Gén. Méd. Vét., 19 (1912), No. 221, pp. 237–256*).—This disease of sheep, differing from anthrax and symptomatic anthrax and new to Argentina, was first observed by the author in September, 1910, in the district of Castelli. It appears to have prevailed for a number of years, particularly during the winter of 1910, in the districts in the southeast of the Province of Buenos Aires, resulting in a mortality of 8 per cent.

The morphological, staining and cultural characteristics, and pathogenicity of the organism found in sheep dead of "La Mancha," lead the author to conclude that it does not differ from the bacillus of Preisz and Nocard, or the caseous suppuration bacillus of Nocard and Leclainche (E. S. R., 14, p. 910). The disease resembles, in many ways, that studied in 1908 by Carré and Bigoteau in France (E. S. R., 20, p. 481), known as "mal rouge."

Arteriosclerosis epidemic in sheep, J. LIGNIÈRES (*Rev. Gén. Méd. Vét., 20 (1912), No. 229, pp. 1–10, fig. 1; Rev. Zootéc., 4 (1912), No. 37, pp. 1–7, pl. 1; Amer. Vet. Rev., 42 (1912), No. 3, pp. 284–292*).—The author concludes that the epidemic among sheep in the district of Castelli, Argentina, described by F. Sivori, as above noted, under the name of "La Mancha" or ovine toxinæmia due to a form of the bacillus of Preisz and Nocard (*Bacillus tuberculosis ovis*), and compared with the "mal rouge" of Carré and Bigoteau, can not be due to that organism since it is not found in the greater number of cases and also because the disease instead of being of a fulminating type is a chronic affection which lasts several months and possibly several years. The hard and often generalized lesions of arteriosclerosis found in all the diseased animals are thought to explain the phenomena observed, and particularly the sudden death.

Further research is deemed necessary before the exact cause of these veritable epidemics of arteriosclerosis, the origin of which appears to be an intestinal infection, can be determined.

Enzootic paraplegia of ovines, J. M. QUEVEDO (*Rev. Zootéc., 3 (1912), No. 33, pp. 646–657, pls. 2*).—This disease, commonly known as mancha, chucho, vértigo, and pataleta, is characterized anatomically by lesions of the medulla, and physiologically by motor disturbances which are nearly always of the paraplegic type. Acute, subacute, and chronic forms are described.

Experimental transmission of sheep pox to the gazelle and the mouflon, DUCLOUX (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 18, pp. 767, 768*).—The author finds that sheep pox can be experimentally transmitted to closely related species. The mouflon (*Ovis tragelaphus*) appears to be less susceptible than is the gazelle (*Gazella dorcas*).

The relation of the Bacillus voldagsen to hog cholera, L. HAENDEL and GILDEMEISTER (*Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), Beiheft, pp. 78–83; Berlin. Tierärztl. Wchnschr., 28 (1912), No. 34, pp. 625–627*).—This is a continuation of work noted (E. S. R., 26, p. 785), and shows that the *B. voldagsen* (previously termed *Bacillus suipestifer*, Voldagsen) when taken directly from the animal will agglutinate pestifer and paratyphoid sera. According to this it is not possible to differentiate these cultures from one another with the aid of the agglutination reaction. Hetsch's solution, on the other hand, is not affected by the Glässer and voldagsen strains, while the pestifer and paratyphoid B organisms redden the medium, precipitate, and produce gas.

The main thesis of this work was to determine whether the *B. voldagsen* had any relation to the production of hog cholera or whether it was a secondary infection. In the tests there were 5 serum animals, 3 animals infected with hog cholera virus, 4 infected with the *B. voldagsen*, one animal which had recovered from an attack of the virus fed with the *B. voldagsen*, and 6 untreated animals. Of these 19 animals 13 died after being in the stall from 3 to 4 weeks. The 5 which were treated with serum and one of the untreated animals were alive at the end of the experiment, the fact that the untreated animal lived being explained by the use of a very weak hog cholera virus. A bacteriological examination of the cadavers revealed that the 5 experimentally infected with the *B. voldagsen*, showed the presence of *B. voldagsen;* 1 infected with hog cholera virus, *B. voldagsen*, and the other 2 with *B. voldagsen* and *B. suipestifer;* and 2 untreated animals, *B. voldagsen* and *B. suipestifer*, and the other 3, *B. suipestifer*. That is, 10 out of 13 animals showed the presence of *B. voldagsen*. The results were interpreted in the light of Uhlenhuth's findings. See also the work of Dammann and Stedefeder (E. S. R., 24, p. 390).

The relation of the Bacillus voldagsen to hog cholera, W. PFEILER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 36, pp. 667, 668*).—By feeding 100 young pigs with *B. voldagsen* classical hog cholera was produced in these animals. The disease could then be transferred from pig to pig by cohabitation, and practically all animals so infected died. In addition to the above tests 3 animals were immunized with antihog cholera serum, 2 others were immunized against *B. voldagsen*, and one animal free from hog cholera was fed with *B. voldagsen*. In the course of a few weeks the pig fed with the *B. voldagsen* and those immunized against hog cholera became sick and died. The animals immunized against the *B. voldagsen* remained alive. The above findings are contrary to those obtained by Haendel and Gildemeister noted in the abstract above.

The infectiousness of serum and serum-free blood corpuscles in hog cholera, R. R. DINWIDDIE (*Arkansas Sta. Bul. 111, pp. 461–479*).—The author's investigations here reported have led him to conclude that the virus of hog cholera as it exists in the blood is prominently intracorpuscular in habitat; that it also occurs in the serum or plasma by whatever mode these are obtained; and that in shed blood it escapes from the corpuscles into the surrounding fluid either with or without hemolysis. He has found that, so far as his investiga-

tions have extended intracorpuscular hematozoa are invariably present in hog cholera, but concludes that much work requires to be done before any assertions can be made as to the relation of these organisms to the disease.

Hog cholera and preventive serum, F. M. HAYES (*California Sta. Bul. 229, pp. 22, figs. 10*).—A general account, including a summary of the campaign in California.

The determinative cause of typhoid fever of the horse (influenza, grippe), J. BASSET (*Rec. Méd. Vét., 89 (1912), No. 3, pp. 88–93, figs. 4*).—The author has previously determined (E. S. R., 26, p. 384) that influenza of the horse is an inoculable disease, caused by a nonculturable, filterable virus. In the present paper he reports investigations which show that serum from a horse suffering from this disease does not lose its virulence when kept at a low temperature for a period of 3½ months. The horses which recover are carriers of the virus, which remains infective during a period of at least 3 months, their serum 3 months after apparent cure having conserved its activity and conveyed the disease to a healthy horse which was inoculated intravenously. A first attack of the disease confers a complete and immediate immunity to a new inoculation of the virus for a period of at least 4 months.

These experimental results are said to show points in common with the infectious anemia of Carré and Vallée.

On influenza (fièvre typhoïde) of the horse, J. BASSET and M. MOLLEREAU (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 8, pp. 174–183*).—A continuation of the investigations above noted. That the blood of a horse 6 months after recovering from influenza is devoid of all virulence was shown by the intravenous injection of 500 cc. of blood serum into a 14-months-old colt and of 700 cc. of defibrinated blood at 2 injections, several days apart, into a second colt of the same age.

Cerebro-spinal meningitis of the horse and its relation to influenza (maladie typhoïde), J. LESAGE (*Rev. Gén. Méd. Vét., 20 (1912), No. 231–232, pp. 129–140*).—Clinical observations and experiments made during the course of an epidemic of cerebro-spinal meningitis in France in 1911 have led the author to the following hypothesis:

"The cerebro-spinal meningitis of the horse is only a form of the typhoid disease. The organism considered to be the specific cause of the disease shows a great variability in size; it is conveyed in water and in forage of poor quality, gaining entrance by way of the digestive tract and causing a temporary diplococcemia. The immediate elimination of suspected water and forage constitutes the basis of prophylactic treatment."

Navel ill, F. S. SCHOENLEBER (*Kansas Sta. Circ. 26, pp. 3*).—A brief popular account.

Equine spirochetosis.—A case of Spirochæta equi in a horse from the colony of Eritrea, M. CARPANO (*Ann. Ig. Sper., n. ser., 22 (1912), No. 1, pp. 213–232, pl. 1*).—The author records the occurrence of this disease in the lower zone of the colony of Eritrea. A bibliography of 44 titles is appended.

A microscopic and mycologic study of Microsporum equinum, E. BODIN (*Rec. Gén. Méd. Vét., 19 (1912), No. 227, pp. 621–641, figs. 9*).—A study of the causative agents of one of the forms of ringworm in the horse.

Pseudorabies or infectious bulbar paralysis in Brazil, A. CARINI and J. MACIEL (*Bul. Soc. Path. Exot., 5 (1912), No. 8, pp. 576–578*).—The authors record the occurrence of Aujeszky's disease in Brazil, this being the first report of its occurrence in South America. The disease is said to be frequently met with, having been reported from the States of São Paulo, Rio de Janeiro, Minas Geraes Goyaz, and Matto-Grosso.

The use of normal horse serum in the treatment of distemper, MALZEW (*Abs. in Vet. Rec., 25 (1912), No. 1254, p. 34*).—The subcutaneous administration of normal horse serum in doses varying from 10 to 15 cc. gave beneficial results, 10 of 12 dogs treated in this way recovering from the disease.

Transmission of Leishmania from dog to dog by Pulex serraticeps, E. and E. SERGENT, A. LHÈRITIER, and G. LEMAIRE (*Bul. Soc. Path. Exot., 5 (1912), No. 8, pp. 595–597*).—A large number of fleas which fed upon an infected dog from 1 to 8 days before transmitted the disease to a healthy dog upon which they were placed.

A third contribution to the etiology of beriberi, W. P. CHAMBERLAIN, E. B. VEDDER, and R. R. WILLIAMS (*Philippine Jour. Sci., Sect. B, 7 (1912), No. 1, pp. 39–52*).—The experiments here reported substantiate the theory that polyneuritis gallinarum and beriberi are caused by the deficiency of some as yet unknown substance in the food, it having been previously shown that the substance is not a phosphorous compound.

"Kohlbrugge's theory that beriberi is caused by an acid intoxication, which is due to the fermentation of rice by various saprophytic bacteria contained in the kernel, must be regarded as untenable. To the list of substances which we have shown in previous papers to be of no importance in preventing neuritis of fowls there may now be added the following: Nitrogenous compounds such as arginin, histidin, asparagin, and various other amino-acids; lipoids of the lecithin group and cholin; extract of onions. The neuritis-preventing principle is insoluble in ether. The neuritis-preventing principle is absorbed by animal charcoal and the filtrate through the charcoal will not prevent neuritis. After absorption the active principle can not be removed from the charcoal by maceration with water, absolute alcohol, or ether. The administration of large quantities of sodium chlorid failed to produce edema in fowls suffering from polyneuritis. Five cc. of our extract (equivalent to 5 gm. of rice polishings) is sufficient to protect fowls subsisting upon polished rice. Two and one-half cc. (equivalent to 2.5 gm. of polishings) is insufficient to confer complete protection against polyneuritis."

Aspergillosis in meat inspection at the central halls, RAYMOND (*Hyg. Viande et Lait, 6 (1912), No. 9, pp. 489, 490; abs. in Vet. Jour., 68 (1912), No. 450, p. 716*).—This paper reports observations of the disease in fowls, ducks, geese, and turkeys.

RURAL ENGINEERING.

The use of dynamite in farming, E. V. WILCOX (*Hawaii Sta. Press Bul. 38, pp. 7*).—The soil conditions in Hawaii are such that despite careful cultivation and breaking with a subsoil plow, there still exists a subsoil impervious to air and water, which readily re-forms after being broken and quickly forms from the top soil which is turned under.

Experiments were conducted with dynamite for breaking this impervious subsoil and for tree planting. A low velocity 25 per cent dynamite was used, the sticks being 1¼ in. in diameter by 8 in. long, and placed to a depth of about 2½ ft., varying with the nature and condition of the soil. The holes were driven with iron bar and hammer. It was found that the hole spacing and the amount of explosives depended largely on the nature and condition of the soil, but that in general the cracks from the explosions in 8 ft. by 8 ft. or 9 ft. by 9 ft. spacing will meet, thus shattering the entire subsoil area inclosed by the holes. The holes should be firmly tamped from the stick of dynamite to the ground surface in order to confine the explosive action entirely to shattering the subsoil. A few preliminary tests will determine whether a half stick is sufficient explosive or whether a whole stick will be required.

The cost of these experiments was about 3 cts. per hole, thus making the cost of 8 ft. by 8 ft. spacing $20.40 per acre; of 9 ft. by 9 ft. spacing $16.10; of 10 ft. by 10 ft. spacing $13.05; and of 20 ft. by 20 ft. spacing $3.25. The ordinary plowing and cultivating operations must be performed in addition.

Revenue report of the irrigation department, Punjab, for the triennial period 1908–9 to 1910–11, A. J. SCRATCHLEY (*Rev. Rpt. Irrig. Dept. Punjab. 1908–1911, pp. 8+23+LXIX, pls. 4*).—A report of the physical and financial condition of major and minor irrigation works in Punjab for this period, with tabulated data, maps, and diagrams.

Small storage reservoirs, KERNS and SESSIONS (*Pacific Rural Press, 84 (1912), No. 14, p. 328*).—The authors advocate the use of small storage reservoirs where the water supply is limited and likely to be lost by seepage and evaporation in conveyance. On small tracts of from 20 to 40 acres a small pump can be kept in continuous operation, and the water stored and economically applied in about 12-hour pumpings to small strips of land proportioned to the size of the reservoir. A table is given showing the size and capacity of different centrifugal pumps, and the depth of water, dimensions of levee, and inside dimensions for square and circular reservoirs to hold 12 hours' supply.

Small pump and reservoir v. large pump, C. R SESSIONS (*Pacific Rural Press, 84 (1912), No. 16, p. 385*).—Cost estimates from actual experiences are reported, showing that by the use of a small pump and reservoir instead of a large pump on a small private irrigation project a saving could be made of $225 in the investment and 80 cts. per acre per year in the irrigating cost.

Calculations of pump slippage, W. G. KIRCHOFFER (*Power, 36 (1912), No. 15, pp. 521–524, figs. 2*).—Results of tests for slippage on several large pumping engines, and a convenient diagram for determining the discharge of a pump with a given slippage, are given.

Definitions and equivalents for irrigation and hydraulic computations, W. K. KRITZER (*Pacific Rural Press, 84 (1912), No. 4, pp. 78, 79*).—This article defines irrigation water measurement terms, and gives lists of equivalents for cubic water measurements, miner's inches, second feet, acre inches, water weights and measures, and land measurements.

A treatise on concrete, plain and reenforced, F. W. TAYLOR and S. E. THOMPSON (*New York and London, 1912, 2. ed., pp. XVIII+807, figs. 249*).—This work deals in a comprehensive and practical manner with the developments in the design and construction of plain and reenforced concrete. It contains chapters on the elements of concrete work, specifications, cements and their tests, aggregates, proportioning concrete, preparation of materials, mixing and depositing concrete, effect of sea water on concrete, fire and rust protection, water-tightness, strength of plain concrete, and the design of plain and reinforced concrete structures.

Construction of surfaces with bituminous materials, A. H. BLANCHARD (*Good Roads, n. scr., 4 (1912), No. 18, pp. 200–202*).—This is a paper presented at the American Road Congress at Atlantic City, N. J., 1912, in which the author gives a brief résumé of typical practice in bituminous surface construction, and a review of some of the causes of failure, the most important of which are unsatisfactory condition and character of the original surface, the use of unsuitable materials, poor construction, and unfavorable local conditions. He concludes that failures may be largely eliminated if engineers will devote more time to a consideration of the physical and chemical properties of the materials they employ, and to a careful study of the above causes of failure.

Effect of wagon roads, J. R. MARKER (*Ohio Highway Dept. Bul. 16, 1912, pp. 86, figs. 16*).—This bulletin discusses the work of the bureaus of construction, maintenance and repair, and bridges of the Ohio State Highway Depart-

ment, and gives speeches by E. L. Lampson and G. W. Harris on the financing of inter-county wagon roads.

A new wind motor, A. DE SAPORTA (*Prog. Agr. et Vit. (Ed. l' Est-Centre), 33 (1912), No. 31, pp. 148–150, fig. 1*).—A wind motor is described consisting essentially of a balanced fan wheel set on a vertical transmission shaft and partially inclosed in a segment of a hollow sheet iron cylinder, which is also balanced and is attached concentrically to the same shaft but has an independent resting base and motion. At the top of the cylinder is a fan which obeys the slightest breeze and maintains constantly the required position. This motor, it is claimed, is so sensitive as to utilize the slightest breeze, yet is strong enough to withstand windstorms and compensates for wind velocity variation.

Application of wind motors, F. ZINK (*Wiener Landw. Ztg., 62 (1912), No. 57, p. 679, fig. 1*).—This article outlines the fundamental technical principles of the use of wind power for pumping and generating electricty for general farm use.

Relative transmitting capacities of drive belts [and pulleys] (*Thresher-men's Rev., 21 (1912), No. 6, p. 52, fig. 1*).—This is a discussion of the relation between power capacity and slip in combinations of different pulleys and drive belts, including tables and a diagram of tests of iron, wood, leather-lagged, and paper pulleys operating a single leather belt 4 in. wide at a speed of 2,300 R. P. M. under a tension of 170 lbs. per square inch and an arc of contact of 180°. These show that at maximum loads the slip of both the leather-lagged and paper pulleys is less than that of the iron, but the former transmits only 90 per cent as much power while the latter transmits 72 per cent more. The wood pulley shows great slip and low power transmission. The correct design is such that at normal loads the slip shall not exceed about 2 per cent and the overload capacity represent a fixed ratio (about 150 per cent) to normal load, on which basis the diagram shows least slip and greatest transmitting capacity for the paper pulley, with the leather-lagged superior to the iron up to 3½ horsepower, and the wood superior up to 2½ horsepower. For farm machinery endless rubber and canvas belts are favored for all conditions, and endless leather belts when under cover.

Harvesting ice by electric power, P. A. BATES (*Sci. Amer., 107 (1912), No. 15, pp. 299, 300, figs. 4*).—The author describes a homemade ice carrying machine by which the blocks of ice when once on the runway are drawn along by an endless chain driven by an electric motor, which is supplied in turn with current from a small lighting plant. Two hundred tons of ice were harvested in 4 days using 5 men, which work previously required 5 men and from 4 to 6 teams for 5 days. The endless chain is so geared as to pick up 4 cakes of ice in 50 seconds and when the elevating bridge is fully elevated about 2½ horsepower are required for continuous operation.

[Tests of a power cream separator], ROI and RÜTTERS (*Molk. Ztg. [Hildesheim], 26 (1912), No. 81, pp. 1529–1531, figs. 2; Molk. Ztg. Berlin, 22 (1912), No. 39, pp. 457–460, figs. 10*).—This article describes the mechanical details and operation of the centrifugal cream separator, and gives tabulated results of tests of the machine running under both normal and unfavorable conditions. The results indicate a rigid separation of the cream and milk and the conclusions are that the machine is economical and efficient.

Tests of vineyard hoes, P. LABUE (*Rev. Vit., 37 (1912), No. 961, pp. 669–672, figs. 2*).—This describes and gives the results of tests in various kinds and conditions of soil of several vineyard hoeing machines, including scarifiers, scrapers, and weed hooks, especially noting the tractive force required in operation. This averaged much less for the various implements than in previous tests, due to the improvement in construction and the condition of the ground.

A tractive effort per square decimeter of tilled section of from 20 to 30 kg. is adopted as a good standard for the scarifiers and cultivators, and from 25 to 35 kg. for the ground scrapers and weed hooks on average vineyard soil.

Horse stalls, GOLDBECK (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 32, pp. 489–493*).—This article deals with the methods of horse stall location and construction whereby good ventilation, drainage, dryness, and general sanitation may be obtained. It recommends the use of nonconducting materials for construction such as wood, brick, limestone, or quarry stone, but states that in order to obtain ventilation and dryness means must be provided for free air circulation such as grated-timber joints or a system of air shafts in the masonry construction so installed as to ventilate, keep the walls dry, and yet not subject the animal to a strong air draft. It also advocates the use of lime and other materials for absorbing excess moisture.

Galvanized iron farm buildings, B. G. MARSHALL (*Pacific Rural Press, 84 (1912), No. 16, p. 384*).—The author states from investigations that galvanized iron made by the present improved process is, compared to wood, a cheap and practical material for many farm buildings such as granaries, hay sheds, tool houses, workshops, wagon sheds, storehouses, etc., and in mild average climates for stock barns and poultry sheds. The objections to galvanized iron are that it affords less protection against extremes in temperature since it readily conducts heat and cold, and that it is liable to rapid corrosion unless manufactured of pure material.

The heathful farmhouse, HELEN DODD (*Boston, Mass., 1911, 2. ed., pp. X+69, pls. 4, figs. 11*).—This book deals with the general arrangement of the farmhouse whereby sanitation, convenience, comfort, and general cleanliness may be obtained. It contains chapters on the kitchen; the shed; the cellar; ventilation; the dining room; the living room, bedrooms; halls, stairways, and bathroom; general scheme of living; and the opportunity of the consolidated school.

Water supply systems in the farm home, S. E. BROWN (*Farm Implements, 26 (1912), No. 10, pp. 36, 38, figs. 7*).—The author deals with pressure water systems for farm houses and buildings, especially describing the new fresh water system in which the water is delivered fresh from the well to the faucet.

This system consists essentially of an air compressor driven by a small gas engine or electric motor, an air-tight steel air pressure tank, and an autopneumatic pump for each source of water supply. These pumps consist of 2 small metallic chambers submerged in the water. When a faucet is open they automatically fill and discharge, because of the air pressure from the storage tank, thus giving a continuous flow of fresh water. For satisfactory service with this system the lift must not be over 100 ft. and the water must be free from sand, grit, and other impurities. A table of test results is given showing the gallons of water that can be drawn from faucets by autopneumatic pumps at various working pressures from a 1,000 gal. air tank, with an estimate of the water used for various purposes on the farm.

Simplified lightning conductors, JOCHIMSEN (*Fühling's Landw. Ztg., 61 (1912), No. 13, pp. 452–457*).—It is noted that in many cases in which lightning has struck buildings where sufficient metal was present on their outer surface, the lightning has jumped here and there to the different metal parts on its way to the ground without injury to the buildings. Metal weather vanes, sheet iron roofs, metal gutters, waterspouts, etc., have been found to protect buildings from lightning. It is suggested, since copper and zinc lightning rods with gold and platinum points are unsightly, expensive, and short-lived, that where possible galvanized hoop iron or galvanized iron wire be used to connect weather

vanes, sheet iron roofs, gutters, etc., with the ground. This method it is claimed complies with the German laws, serves the same purpose as a lightning rod, is not unsightly in appearance, and costs about one-third as much.

RURAL ECONOMICS.

Land problems and national welfare, C. TURNOR (*London and New York, 1911, pp. XVII+344*).—This volume is divided into chapters treating of the following subjects: The landowner, the farmer, the rural laborer, education and agriculture, political economy and the land, small holdings and agriculture, agricultural organization, politics and the land, and the land and the empire. The author makes a number of observations regarding the system of land tenure in England, describing its merits and defects with marked familiarity and emphasizing the economic necessity of more intensive culture. He suggests that landlords should study agriculture with the idea of enabling the country to produce foodstuffs sufficient to be self-sustaining.

Large and small holdings, H. LEVY (*Cambridge, England, 1911, pp. VIII+249*).—This publication presents some observations regarding the recent evolution of the system of agricultural holdings in England, characterized by a decrease in large farms and an increase in small and medium-sized holdings, together with a study of some of the economic forces which have brought about changes in the types of farming. It shows that the economic superiority of one type over another is not due to the size of the farm but is mainly dependent upon their respective relative advantages in regard to certain kinds of products, usually determined by market conditions. "As the market conditions change the agricultural production changes and as the production changes the unit of holding changes." The author illustrates this by showing that under the present conditions the large farm is absolutely superior to the small one in regard to grain growing, mixed husbandry, or the breeding of pedigree stock, while the small farm is the unit best suited for stock farming, market gardening, etc. A lengthy bibliography is appended.

[Farms classified by size in the United States] (*Bur. of the Census [U. S.] Bul., Agr. U. S., 1910, Abs.—Tenure, etc., pp. 19–24*).—The following table, compiled by the Bureau of the Census, shows for 1910 and 1900 the number of farms in each of the various size groups and also the acreage for a smaller number of groups for the United States as a whole:

Farms in the United States by size groups, 1910 and 1900.

Size of group.	Number of farms.			Land in farms.			Percentage of total.			
							Number of farms.		Land in farms.	
	1910	1900	Increase	1910	1900	Increase	1910	1900	1910	1900
			Per ct.	*Acres.*	*Acres.*	*Per ct.*				
All farms	6,361,502	5,737,372	10.9	878,798,325	838,591,774	4.8	100.0	100.0	100.0	100.0
Under 20 acres	839,166	673,870	24.5	8,793,820	7,180,839	22.5	13.2	11.7	1.0	.9
Under 3 acres	18,033	41,385	(a)	.....	.....	.....	.3	.7	.....	.....
3 to 9 acres	317,010	225,844	40.4	.....	.....	.....	5.0	3.9	.....	.....
10 to 19 acres	504,123	406,641	24.0	.....	.....	.....	7.9	7.1	.....	.....
20 to 49 acres	1,414,376	1,257,496	12.5	45,378,449	41,536,128	9.3	22.2	21.9	5.2	5.0
50 to 99 acres	1,438,069	1,366,038	5.3	103,120,868	98,591,699	4.6	22.6	23.8	11.7	11.8
100 to 174 acres	1,516,286	1,422,262	6.6	205,480,585	192,680,321	6.6	23.8	24.8	23.4	23.0
175 to 499 acres	978,175	868,020	12.7	265,289,069	232,954,515	13.9	15.4	15.1	30.2	27.8
175 to 259 acres	534,191	490,069	9.0	.....	.....	.....	8.4	8.5	.....	.....
260 to 499 acres	443,984	377,951	17.5	.....	.....	.....	7.0	6.6	.....	.....
500 to 999 acres	125,295	102,526	22.2	83,653,487	67,864,116	23.3	2.0	1.8	9.5	8.1
1,000 acres and over	50,135	47,160	6.3	167,082,047	197,784,156	−15.5	.8	.8	19.0	23.6

a Data for 1910 and 1900 not comparable.

Other statistics are given for each State and geographic division showing the number of farms, total and improved acreage, and value of land and buildings by size and groups, together with the percentage of the several totals represented in each size group.

Color and nativity of farmers (*Bur. of the Census* [*U. S.*] *Bul., Agr. U. S., 1910, Abs.—Tenure, etc., pp. 12–18, fig. 1*).—Notes and tables are given which show for each State and geographic division the total number of farms in the United States in 1910 operated by native whites, foreign-born whites, and colored persons, respectively, the farms of each group being further classified according to the tenure of the operator.

Of the 6,361,502 farms in the United States in 1910 it is shown that 75 per cent were operated by native whites, 10.5 per cent by foreign-born whites, and 14.5 per cent by negroes and other nonwhites, whereas "of the males 21 years of age and over in the United States in 1910, 65.6 per cent were native white, 24.6 per cent foreign-born white, and 9.8 per cent colored." In each of the geographic divisions, except New England, a larger proportion of the foreign-born white farmers than of the native whites own their farms, the percentages being, respectively, 81.4 and 66.3. The number of negro farmers increased much more rapidly between 1900 and 1910 than that of white farmers, the respective percentages of increase being 19.6 an 9.5. In the South 60.1 per cent of the white farmers are reported as landowners as against 24.5 of colored farmers.

Tenure of farms (*Bur. of the Census* [*U. S.*] *Bul., Agr. U. S., 1910, Abs.—Tenure, etc., pp. 1–7, figs. 2*).—This bulletin shows in condensed form the main results of the Thirteenth Census of the United States with reference to the tenure of farms, presenting the statistics by States and geographic divisions, and summarized below:

Tenure in the United States, 1910 and 1900.

Class of operator.	Number of farms.			Land in farms.			Percentage of total.			
	1910	1900	Increase	1910	1900	Increase	Number of farms.		Acreage.	
							1910	1900	1910	1900
			Per ct	*Acres.*	*Acres.*	*Per ct*				
Owners	3,948,722	3,653,323	8.1	598,554,617	556,040,051	7.6	62.1	63.7	68.1	66.3
Owning entire farm	3,354,897	3,201,947	4.8	.....	.....	.....	52.7	55.8	.....	.....
Renting additional land	593,825	451,376	31.6	.....	.....	.....	9.3	7.9	.....	.....
Managers	58,104	59,085	−1.7	53,730,865	87,518,186	−38.6	.9	1.0	6.1	10.4
Tenants	2,354,676	2,024,964	16.3	226,512,843	195,033,537	16.1	37.0	35.3	25.8	23.3
Shares	1,399,923	1,273,299	20.0	.....	.....	.....	22.0	22.2	.....	.....
Share-cash	128,466						2.0			
Cash	712,294	751,665	9.9	.....	.....	.....	11.2	13.1	.....	.....
Not reported	113,993						1.8			

Other tables are given which show that the ratio which the acreage of improved land bears to the total farm acreage and the average value of land and buildings per acre of land is higher in the case of tenant farms than in the case of farms operated by owners in every geographic division. The average value of land and buildings per farm is also greater for tenant farms than for farms operated by owners except in the 3 southern divisions.

[Farm mortgages in the United States] (*Bur. of the Census* [*U. S.*] *Bul., Agr. U. S., 1910, Abs.—Tenure, etc., pp. 8–11, fig. 1*).—Notes and statistics are here given showing by States and geographic divisions mortgage indebtedness on

farms operated or occupied by owners and the number free from mortgage in the United States in 1890, 1900, and 1910.

In the United States as a whole the number of farms operated or occupied by owners and free from mortgage is shown to have increased much less rapidly during each of the last two census decades than the number of farms mortgaged, the proportion mortgaged being 28.2 per cent in 1890, 31.1 per cent in 1900, and 33.6 per cent in 1910. It is noted further that in every geographic division, except the Middle Atlantic, the proportion of farms mortgaged was greater in 1910 than in 1900, the most conspicuous increase being in the three southern divisions. This is attributed to increased confidence of lenders in the titles to land and in the ability of farmers to pay.

The total value of the land and buildings of the 1,006,511 farms for which statistics of indebtedness have been compiled was $6,330,000,000 and the amount of debt was $1,726,000,000 or 27.3 per cent of the value. The average amount of mortgage indebtedness per farm is shown to have increased from $1,224 in 1890 to $1,715 in 1910, while the average owner's equity per farm increased from $2,220 to $4,574.

Banking reform in the United States, O. M. W. SPRAGUE (*Cambridge, Mass., 1911, pp. 176*).—The author discusses in this volume the functions, activities, and success of existing central banks and criticises the current plans for the establishment of a central bank of the European type in the United States, suggesting several ways by which the existing banking system may be strengthened with no sacrifice of safety or security. Among the proposals made he recommends segregation of savings deposits in national banks with the power to invest them in mortgages on real estate. This, he contends, would keep in circulation a large percentage of the idle funds deposited most of the time in banks of the large money centers, and at the same time would increase the credit facilities for agricultural purposes.

Cooperative credit unions (*Jewish Farmer, 5 (1912), No. 12, p. 308*).—Notes and tables are here submitted showing the financial standing of each, together with the combined financial standing, of the 8 cooperative credit unions established by the Jewish Agricultural and Industrial Aid Society. Three of these were organized in May, 1911, and 5 in the spring of 1912, 4 being in the State of New York and 4 in Connecticut. Their total membership September 30, 1912, numbered 240 with a capital of $4,223. In less than a year's time they made 342 loans amounting to $23,375, of which $12,309.70 of the principal has been repaid.

Farm bookkeeping, E. H. THOMSON (*U. S. Dept. Agr., Farmers' Bul. 511, pp. 37, figs. 4*).—This bulletin discusses briefly the principles involved in farm bookkeeping; enumerates the difficulties, explains the different types, and suggests methods of simplifying the work of farm bookkeeping; illustrates what accounts to keep, what is to be included in a farm inventory and cash accounts; what constitutes farm profit; labor records; records of separate farm enterprises; live stock records; feeding records; etc.

"Good accounts are within the reach of every farmer. The few minutes regularly spent on them will yield larger returns than an equal amount of time devoted to farm work, provided proper use is made of the information the records contain."

Foreign crops, August-September, 1912, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 40, pp. 24*).—Preliminary estimates on the acreage and production of different cereal crops in 1912 are given for Canada, Great Britain, France, Germany, Holland, Austria, Hungary, Italy, and Russia, together with notes on crop conditions and prospects in a number of smaller European countries and Egypt. In most cases the forecasts for 1912 are compared with the

final estimates for 1911 and 1910. Data are also given on the cotton area in British India for the past 3 seasons and on the Russian flaxseed crop for the years 1906–1910, inclusive. Statistics on sugar production in Spain for the 8 campaigns from 1904 to 1911 and on crop production in Chile for 4 seasons beginning with 1907–8 are included.

AGRICULTURAL EDUCATION.

Professional distribution of college and university graduates, B. B. BURRITT (*U. S. Bur. Ed. Bul., 1912, No. 19, pp. 147, figs. 23*).—The present study aims to provide "complete information as to what college graduates are actually doing, and how this differs from what they did in the seventeenth, eighteenth, and nineteenth centuries, by giving in detail the history of the various professions, including agriculture, in their relations to the alumni of 10 representative institutions, by comparing the development of these professions in 25, and by presenting in addition the combined statistics of 37 such institutions."

In the general summary of statistics it is claimed that "in spite of the comparatively large number of agricultural courses, farming does not attract and never has attracted a very large number of college graduates. . . . Although the number of graduates entering agricultural pursuits is increasing, it is not increasing so rapidly as the number entering other professions. Consequently the curve for the college-bred farmer is falling." [It may be noted that the list of institutions on which this deduction is based consists largely of classical colleges and institutions giving no attention to agricultural instruction. Only 10 of the 37 offer courses in agriculture, and at 4 of these it is a new departure. None of the separate colleges of agriculture and mechanic arts is considered and only 3 of the state universities of the Central West are included—Minnesota, Nebraska, and Wisconsin. In the main, therefore, this bulletin shows merely the extent to which graduates of nonagricultural institutions have taken up agriculture as an occupation.]

[The beginnings of agricultural improvement in Great Britain], T. H. MIDDLETON (*Nature [London], 90 (1912), No. 2243, pp. 235–243*).—This portion of the address of the president of the section on agriculture, delivered at the 1912 meeting of the British Association at Dundee, briefly summarizes some of the early attempts to improve agriculture in England and Scotland.

Coordination of agricultural education (*Rpt. Rural Ed. Conf. [Gt. Brit.], 6 (1912), pp. 17*).—This report is made in response to a request from the Board of Agriculture and Fisheries that the Rural Education Conference consider and advise as to the coordination of the agricultural staffs employed by counties and by collegiate centers serving the area in which the county is situated.

The conference report compares the Scottish system of agricultural education with that of England and Wales, describes the present situation as regards cooperation between a central institution and county staff in England and Wales, and recommends as follows: That the 12 institutions to be designated by the Board of Agriculture and Fisheries as centers of advisory work should be regarded as the units for the purposes of agricultural education. The work in each division should comprise (1) courses of instruction carried on within an institution, whether a university agricultural department, agricultural college, or farm institute, the responsibility remaining with the governing board of the particular institution, and (2) local lectures, classes, and visits to farms carried on outside of an institute, whether by members of a county staff or by members of the central institution.

To effect cooperation between neighboring counties to provide for such extension agencies as a traveling dairy school, farriery van, whole-time horticultural instructor and itinerant cheese instructor, which many of the counties have been unable to provide for themselves, there is recommended for each of the 12 divisions a joint council for agricultural education, which might consist of representatives of each county council, each institution engaged in agricultural education, and certain agricultural societies and organizations within the district. The functions of the joint council would be primarily to promote the organization of the different forms of extension work and to coordinate the whole of the agricultural education of the division, but would vary more or less according to local conditions.

A summary of the evidence received from the secretary of the Scottish Education Department, particulars of the organization for the furtherance of agricultural education in Yorkshire, and other data are appended.

Agricultural instruction in Spain, F. DE LA ROSA (*Bol. Agr. Téc. y Econ., 4 (1912), Nos. 37, pp. 45–55; 38, pp. 149–158; 39, pp. 248–257; 40, pp. 348–358*).—This article contains a brief résumé of rural knowledge in the three great ages of history, followed by a discussion of the impulse given to methods of teaching in the nineteenth century and of the conditions existing at present. The author concludes (1) that the State should establish an institution for higher agricultural education for the entire country empowered to offer degrees. (2) that the stations or central institutions necessary to the scientific investigations of this institution should be directed by agricultural graduates, (3) that professional instruction for farm owners or tenants should be given on the farms in the various regions or provinces and in schools instituted for the purpose, the government to assist these centers according to the necessities in each case, (4) that the unequal distribution of special stations in the various regions should be remedied by the formation of a general plan of redistribution, and (5) that in the reorganization of the school for agricultural experts care should be taken that the instruction given should meet the requirements of the functions of public administration and of special lines of work.

The Royal Horticultural School of Hohenheim, near Stuttgart, P. SCHMIDT (*Gartenflora, 61 (1912), No. 17, pp. 375–378*).—An account is given of the object, equipment, and curriculum of the horticultural school in connection with the Royal Agricultural Institute at Hohenheim.

[Intermediate forest schools in Austria], FÜRST (*Forstw. Centbl., n. ser., 34 (1912), No. 7, pp. 367–377*).—This is a discussion of the objects and future of the intermediate forest schools (Forstmittelschulen) in Austria, including the advisability of transforming them into forest academies.

Regulations governing the examination of forest students in Bavaria (*Forstw. Centbl., n. ser., 34 (1912), No. 7, pp. 378–382*).

Forestry: An elementary treatise, H. H. CHAPMAN (*Chicago, 1912, pp. 79*).—Among the general topics considered in this elementary text are the relation of forestry to government, scope of forestry as a profession, American forests, silvics, fire protection, forest mensuration and valuation, and forest policy.

Agriculture in rural schools, W. H. FRENCH (*Moderator-Topics, 32 (1912), Nos. 30, pp. 615–618; 34, pp. 695–697, fig. 1*).—The author gives directions and practical exercises for conducting a rural school garden, giving instruction in plant propagation and forestry, and beautifying home and school grounds.

The boy and the garden, J. L. BOUGHNER (*Minn. Hort., 39 (1911), No. 8, pp. 306–313, figs. 4*).—The author gives an account of the difficulties met with in an experiment in vacant lot gardening by the Garden Club of Minneapolis. He concludes that vacant lot gardening is of great benefit but can be worked

out successfully only by a standard system under competent supervision and intelligent direction.

Neighborhood improvement clubs for the rural, village, and town communities of Kansas, E. L. HOLTON (*Agr. Ed. [Kans. Agr. Col.], 4 (1911), No. 3, pp. 13*).—The purpose of neighborhood improvement clubs and their constitution, methods of work, topics for discussion, useful books, and program are outlined.

Boys' and girls' agricultural clubs (*Augusta, Maine: Dept. Ed., 1912, pp. 6*).—This pamphlet gives suggestions concerning work that may be undertaken in boys' and girls' agricultural clubs and in exhibitions, rules governing contests, how to make a beginning, constitution, etc.

Boys' and girls' contest plans for 1912 (*Agr. Ed. [Kans. Agr. Col.], 4 (1912), No. 5, pp. 37*).—Directions are given on the organization, work, award of prizes, etc., in corn, garden, tomato, potato, flower garden, poultry, and home economics contests for boys and girls.

Corn bulletin (*Bul. Agr. Dept. Ala., 1912, No. 50, pp. 62, pl. 1*).—This bulletin contains a list of those winning premiums in the 1912 state corn contest in Alabama, with notes as to their cultural methods, yields, profits, etc.

MISCELLANEOUS.

Annual Report of Guam Station, 1911 (*Guam Sta. Rpt. 1911, pp. 35, pls. 5*).—This contains a summary of investigations by the Special Agent in Charge, for the most part abstracted elsewhere in this issue, and entomological notes by D. T. Fullaway, noted on page 158.

Twenty-fourth Annual Report of Louisiana Stations, 1911 (*Louisiana Stas. Rpt. 1911, pp. 24*).—This contains the organization list, a report of the director on the work of each of the stations, a list of the publications issued during 1911, and a financial statement as to the federal funds for the fiscal year ended June 30, 1911, and as to the state funds for the fiscal year ended November 30, 1911.

Thirtieth Annual Report of New York State Station, 1911 (*New York State Sta. Rpt. 1911, pp. VII+352, pls. 29, figs. 12*).—This contains the organization list, a financial statement as to the federal funds for the fiscal year ended June 30, 1911, and as to the state funds for the fiscal year ended September 30, 1911, reprints of Bulletins 333–337, 338 (corrected), 339, and 342, Technical Bulletin 18 (corrected), and Circulars 16 and 17, all of which have been previously noted, a list of the periodicals received by the station, and meteorological observations noted on page 115 of this issue.

Annual Report of Pennsylvania Station, 1911 (*Pennsylvania Sta. Rpt. 1911, pp. 642, pls. 58*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, a report of the director on the work and publications of the station during the year, and departmental reports, the experimental work in which is abstracted elsewhere in this issue. The report also contains several special articles abstracted elsewhere in this issue, a reprint of Bulletin 108, and a corrected reprint of Bulletin 111, previouly noted.

Experiment Station Work, LXXI (*U. S. Dept. Agr., Farmers' Bul. 514, pp. 24, figs. 12*).—This number contains articles on the following subjects: Improved varieties of timothy, hardy alfalfa, harvesting, thrashing, and storing soy beans, soy beans for silage, fat in milk of cows at time of calving, and clean cream.

NOTES.

Arizona University and Station.—Director R. H. Forbes, of the station, has also been given charge of the work of the college of agriculture. It is expected to coordinate the college work more closely with that of the station.

The first farmers' demonstration train operated under the direction of the station completed a very successful trip, and is to be followed by a farmers' two-weeks' short course at the university.

Under the new state law agricultural courses of instruction must now be taught in the Phoenix and Mesa high schools and the Tempe State Normal School.

Illinois University and Station.—Dr. Harry A. Harding, bacteriologist of the New York State Station, has been appointed head of the department of dairy husbandry in the university, as professor of dairy bacteriology in the college and chief of dairy bacteriology in the station.

Nebraska Station.—Howard Gramlich has been appointed assistant in animal husbandry (horses) beginning January 1. He will devote his attention largely to extension work.

New Jersey College and Stations.—The enrollment in the short courses in agriculture is 180, an increase of more than 50 over the preceding year. The new course in home economics is proving especially popular.

The new dairy barn, constructed at a cost of about $10,000, has been completed. It is built of hollow tile and stucco, and will accommodate about 60 head of stock.

The greenhouses used for investigations in floriculture have been extended to provide room for experiments in growing carnations. The equipment of the department of animal husbandry has been enlarged to allow the conducting of feeding experiments with swine.

Dr. Mary Robinson, assistant in plant breeding, Harry B. Holcombe, assistant in horticulture, and George B. Thrasher, field assistant in horticulture, have resigned. George W. Martin has been appointed instructor in botany, Miss Marion T. Pleasants assistant in plant breeding, and William Schieferstein assistant in horticulture.

Cornell University and Station.—The poultry building at the college of agriculture is now being occupied by the poultry husbandry department, and temporarily by the department of farm management. The building is of fireproof construction, 132 by 48 feet, with three stories and basement, and is fitted with lecture rooms, laboratories, an incubator cellar, rooms for killing, picking, and packing poultry and for testing and grading eggs, a cold-storage room, offices, and other facilities for instruction in poultry husbandry. Accommodations for the fowls are now to be provided near the new building. The poultry farm has been enlarged to about 80 acres, a part of which is being utilized for the general breeding work and investigations.

The new building for the department of home economics is also completed. This is a four-story and basement building, costing about $150,000. Among the special features are a cafeteria in the basement seating about 500, a small living apartment on the first floor for the practical training of senior students, an auditorium and four food laboratories on the second floor, laboratories for

the study of clothing, sewing, and millinery on the third floor, and a large drafting room for house planning and the designing of clothing on the fourth floor. The department of forestry will occupy a portion of the building pending the completion of the forestry building, now under construction.

According to the *Cornell Daily Sun*, returns compiled by the college of agriculture from replies from 1,467 former students show that 65 per cent are now engaged in general agricultural, horticultural, and dairy work, and that about 15 per cent more have become teachers and officers in departments of agriculture, agricultural colleges, and experiment stations.

Recent appointments include Dr. Karl M. Wiegand as professor of botany, and Arthur Bernhard Recknagel, of the Forest Service of this Department, as professor of forestry. Rhett Y. Winters has resigned as instructor in plant breeding to accept a position as assistant agronomist in the North Carolina College Station.

Rhode Island Station.—J. E. Seabright, assistant in chemistry, has resigned to accept a position as chemist in the board of health laboratory of Gary, Ind.

Tennessee University and Station.—The organization of the university has been further differentiated by the formal establishment of colleges of agriculture and engineering. Director H. A. Morgan of the station has been appointed dean of the college of agriculture.

The eight-weeks' short course in agriculture opened with Farmers' Week January 6. Special reduced railway rates have been secured for the first time.

Society for the Promotion of Agricultural Science.—The thirty-third annual meeting of the society was held at Atlanta, Ga., November 12, 1912. The address of the president, Dean E. Davenport, was delivered at a joint evening session with the American Society of Agronomy. It dealt with Obstacles to Progress in Agricultural Science, detailing some of the difficulties which arise from the newness of the science, the expectation of conclusive results which will have a practical application in farming, the undersupply of trained and experienced men, and the general demand for extension work which threatens the most healthy development of agricultural science.

Another set of obstacles grow out of restrictive legislation or administrative rulings, the regulation of the station, state requirements in regard to printing, furnishing of supplies, etc. In some instances such restriction has become cumbersome and annoying, and has limited the freedom essential to the highest usefulness.

Dr. F. W. Woll, of the Wisconsin Station, presented data bearing on The Relation of the Body Weights of Dairy Cows to Their Production, gathered in the study of many representatives of different breeds. It was concluded that "there is in general a definite relation between the production of cows of different body weights, the heavier cows being capable of a larger production than light cows; the production is also made more economically as regards the amount of feed eaten, hence the largest net returns are obtained from such cows."

The Fertilizer Requirements of South Carolina Cotton Soils were discussed in a paper by Director J. N. Harper, in which consideration was given to soil types and the variations brought out in field experiments.

Under the head of Notes on Citrus Investigations in Florida, Director P. H. Rolfs presented two topics. The passage of a state law prohibiting the sale and transportation of immature citrus fruits raised the necessity of a standard for maturity, which was finally fixed upon by a state commission. Under this standard all oranges containing 1.25 per cent or more of acid (calculated as citric acid) are considered as immature. Professor Rolfs also described the successful use of aschersonia spores against the white fly and *Sphærostilbe*

coccophila against the San José scale, detailing the essentials of success, the reason for failures, and the opposition especially from manufacturers of sprays and spraying materials. Nowhere else in the world, he said, have fungi been so widely and successfully used for the control of insect pests as in Florida.

Under the head of Two Important Western Poisonous Plants, Director H. G. Knight, of Wyoming, described the losses of sheep from woody aster and death camas, and detailed the efforts to ascertain the cause of the poisonous properties of these plants. These studies resulted in the isolation of unidentified alkaloids from the woody aster, and the separation and description of a new alkaloid, which has been named zygadenine, from the death camas.

A report on Investigations on Soil Fertility in Texas, by Dr. G. S. Fraps of the Texas Station, detailed the extensive studies of the constituents of various types of soil. It was concluded that the results of pot experiments are closely related to the active phosphoric acid, active potash, and total nitrogen of the soil; and a basis was worked out for expressing the relative deficiency of a soil in respect to the various elements. "For example, if a soil contains ten parts per million of active phosphoric acid, 120 parts per million of active potash, and 0.08 per cent of nitrogen, we can say that its corn possibility in pot experiments is about 8 bushels for phosphoric acid, about 102 bushels for potash, and about 25 bushels for nitrogen." It was thought that it may be possible to calculate the quantity of phosphoric acid and of nitrogen which should be added to bring mean production up to the lower limit of some other controlling factor, such as the rainfall.

Describing the Distribution of Humus in California Soils, on the basis of examination of over 100 soil columns, Dr. R. H. Loughridge showed that the humus was not confined to the surface layers but was distributed downward through many feet, not only in alluvial but on upland soils of the State. The amount of humus was frequently greater in the second than in the first foot. In a large proportion of the cases it was distributed through the entire 12 feet, and in others was limited by water or bedrock at eight or ten feet. "In reality there is more humus in California soils than is found in those of the uplands of the humid regions, and although not concentrated in the first foot as under humid conditions, it occurs where it is of the greatest benefit to the roots of plants."

Dr. J. G. Lipman presented Observations on Soil Inoculation, pointing out that under field conditions the store of nitrogen in the soil is seldom if ever adequate to make legumes independent of *Bacillus radicicola*. The need of inoculation was held to be more general than is commonly believed, even in good soils. Inoculation was strongliy advised, especially for new legumes, and soil was held generally preferable to artificial cultures for this purpose. The importance was emphasized of so modifying the soil as to make it a fit culture medium for legume bacteria. For this purpose lime, readily available mineral fertilizers, and green manures or animal manures were recommended.

Dr. W. A. Withers and Dr. B. J. Ray, of the North Carolina Station, reported the results of Studies in the Toxicity of Cotton-seed Meal. All cotton-seed meal, no matter what its source, age, or method of manufacture, was found to be toxic to guinea pigs, rabbits, swine, and a calf. Extracts were usually nontoxic, but in every case but one the residue was found toxic. Sodium pyrophosphate in amounts corresponding to the phosphorus in the normal feed was found to be nontoxic to rabbits, and no evidence was found of the presence of toxic alkaloids or of hydrocyanic acid in the seed.

A Report on Dominant and Recessive Characters in Barley and Oat Hybrids, by Director R. W. Thatcher, showed that the hulled, hooded, and two-rowed characters in barley are dominant over bald, bearded, and six-rowed characters,

respectively. In the oat hybrids black was found dominant over the whit hull, and the tree or whorl type of panicle dominant over the side type.

An interesting and suggestive paper by J. F. Voorhees, of the U. S. Weathe Bureau and the Tennessee Station, on Relation of Meteorological Study to Mor Logical Systems of Cropping and Crop Production, pointed out the way in which such meteorological factors as the amount of heat and rain, their sea sonal distribution, and the period of the growing season, reveal the agricultura possibilities of a locality and serve as a guide in planning an economical crop ping system. Knowing the heat or rainfall and their distribution, the object should be to utilize them to the fullest extent, not only to secure a high degree of efficiency in operation but to prevent the injurious effects which an unused residue may cause. The problem is to adjust the cropping and culture to conserve these elements, and maintain the proper relationships between crops. This calls for a knowledge of the growing habit of various crops, which suggests the desirability of extensive cooperation in such studies.

The Relative Accuracy of Field Experiments and Field Studies of Farm Practice was considered in a paper by Prof. W. J. Spillman, of this Department. From several cases presented he concluded that in the case of those problems the data for which actually exist on the farms of the country, a more reliable solution can be obtained by gathering data in large quantities from these farms than by the ordinary experimental methods. This paper provoked considerable discussion and difference of opinion, in the course of which the limitations of the method as applied to problems requiring investigation were urged.

The society adopted resolutions on the death of Dr. M. A. Scovell and Dr. John B. Smith. The officers elected for the ensuing year were as follows: President, Eugene Davenport of Illinois; vice president, H. J. Waters of Kansas; secretary-treasurer, E. W. Allen, Washington, D. C.; member of the executive committee for three years, W. H. Jordan, of New York.

American Farm Management Association.—The third annual meeting of this association was held at Washington, D. C., January 21 to 23. College departments of farm management and extension workers, and the Office of Farm Management of this Department, were strongly represented at the various sessions.

The presidential address was delivered by W. J. Spillman of this Department, on The New Point of View, and discussed in detail some of the fundamental principles of farm management work.

The initial session of the meeting discussed the subject of the teaching of farm management. A report from the standing committee was presented by G. F. Warren, of Cornell University, and The Qualifications of the Teacher of Farm Management were discussed by H. Hayward of the Delaware College and Station. An address on Teaching Farm Management in the Consolidated Rural School was given by Assistant Secretary Hays of this Department, in which he spoke optimistically of the possibilities in this direction.

A. Boss described the plan now being tested at the University of Minnesota of placing a few selected senior students in farm management upon private farms leased to the university, and their management by the student for one year under the close supervision of the institution. A special certificate in addition to the bachelor's degree is awarded upon the successful completion of this work, and the student is also entitled to any profits up to $50 a month which he may be able to obtain.

D. H. Otis explained a vacation course being offered at the University of Wisconsin, in which about six boys are taken for an inspection trip of from three to six weeks. During this trip they live in tents, making preliminary surveys and maps of the localities visited, and otherwise familiarize themselves

with the local details. A general discussion of teaching methods followed, much interest being manifested in ways of increasing a student's efficiency along practical lines.

Systems of management on cotton farms were discussed at the second session. A paper by C. L. Goodrich, of this Department, treated of the seasonal distribution of labor on a cotton farm, and A. D. McNair, of Arkansas, considered the monthly distribution of labor in raising crops in the cotton belt under different systems.

Under the general subject of Cost Accounting, the standing committee on investigation reported the results of a questionaire as to methods of making studies of cost accounting. The subject was further discussed by W. L. Elser, of the Ohio Station, Professor Boss, and C. E. Ladd, of New York. M. C. Burritt, of the *New York Tribune Farmer*, presented a paper entitled How Far May the Individual Records be Taken as an Indication of the General Average?

The subject of Agricultural Surveys was considered in much detail. E. H. Thomson described Some Phases of the Work of the Farm Management Survey, with special reference to the work of this Department. The Value of Farm Management Surveys was discussed by G. F. Warren, who showed the application of certain mathematical principles in the collection of data for this purpose. In his opinion accuracy increases in general as the square root of the number of observations, by reason of the compensating nature of many of the unavoidable errors. He strongly urged the gathering of a large number of records, considering this much less expensive than refinement of methods, and for many purposes as satisfactory. He also advocated the expression of results in units of a permanent nature where possible rather than through those dependent upon such fluctuations as market prices.

W. A. Lloyd, of the Ohio Station, urged the addition of historical information to the data to be collected for a given region, illustrating his remarks with charts showing many historical aspects of Ohio agriculture. H. H. Mowry, of this Department, presented data as to the relative time and cost requirement of a large number of farm operations with special reference to economy in the use of labor. K. C. Livermore, of Cornell University, compared about 50 successful New York farms in detail as to their relative efficiency and the apparent reasons therefor.

Extension Work was the subject of the final session. F. E. Robertson and G. P. Scoville, of this Department, discussed Cooperative County Field Work; Bradford Knapp, of this Department, Demonstration Work in Relation to Farm Management; and F. D. Gardner, of the Pennsylvania College and Station, The Requirements for Successful Farm Advisory Work.

The association concluded its meeting by visiting a dairy farm in Fairfax County, Va., where a practical demonstration of methods of scoring a farm was given by Professor Warren.

Officers for the ensuing year were selected as follows: President, G. F. Warren, Ithaca, N. Y.; vice president, A. Boss, St. Paul, Minn.; secretary-treasurer, C. L. Goodrich, Washington, D. C.

American Society of Agricultural Engineers.—The sixth annual convention of this society was held at Chicago, December 26 to 28, 1912.

The program of the first day was devoted largely to general agricultural machinery interests, and the second to the tractor and standardization questions. O. W. Sjogren, formerly of the University of Nebraska, presented a paper on Tests of Corn Planters, with special reference to accuracy of dropping. C. A. Ocock, of the University of Wisconsin, discussed the Draft of the Plow, as affected by width, depth, and type of moldboard and the condition of the soil. Eugene Becker compared gasoline gas, acetylene, and Blaugas as

illuminants in Isolated Gas Lighting Plants. The Winnipeg Motor Contests were reviewed by L. W. Chase, of the University of Nebraska.

In a paper on Testing of Gas Tractors, C. F. Hirschfeld, of Cornell University, discussed Principles of Fuel Oil Engines. The general question of Standardization in Agricultural Engineering was considered by J. B. Davidson, of the Iowa College, and particular applications by E. H. Ehrman, who described the efforts in this direction being made by the Society of Automobile Engineers, and by J. A. King and W. J. Branlon, who discussed respectively standards in agricultural machinery and gas tractor construction.

The final session dealt with instruction in agricultural engineering. Daniels Scoates, of the Mississippi College, discussed Laboratory Exercises in Farm Machinery, and H. C. Ramsower presented the proposed plans for the agricultural engineering building at Ohio State University.

J. B. Davidson reported for a committee on legislation with reference to efforts being made to establish a bureau of farm power in this Department.

The constitution was extensively amended to provide more rigid requirements for active membership but a wide range of eligibility of other classes of members. Officers were chosen as follows: President, L. W. Chase, Lincoln, Nebr.; vice presidents, E. A. Rumely, Laporte, Ind., and J. A. King, Chicago, Ill.; secretary, I. M. Dickerson, Urbana, Ill.; treasurer, J. L. Mowry, St. Paul, Minn., and councillors, J. B. Davidson, Ames, Iowa, J. L. Stewart, St. Paul, Minn., and W. A. Kavanaugh, Chicago, Ill.

Necrology.—T. V. Munson, a leading authority on the botany and horticulture of American grapes, died on January 21, 1913, in his sixty-ninth year. Mr. Munson produced many hybrid grapes now in cultivation. His intimate knowledge of the American native species enabled him to render valuable assistance to French viticulturists in reconstituting their phylloxera-infested vineyards with resistant stocks. For this service he received a diploma and decorations of the Legion of Honor, with the title "Chevalier du Mérite Agricole." Mr. Munson was a graduate of the Kentucky State University, a member of many horticultural, pomological, and scientific societies at home and abroad, and vice-president of the American Pomological Society and the Association for the Advancement of Horticultural Science. His more important viticultural investigations are incorporated in his Foundations of American Grape Culture.

Aimé Pagnoul, director of the agricultural station at Pas-de-Calais for 20 years and the investigator of a number of problems in chemistry and vegetable physiology relating to cereals and other crops, died recently.

Dr. Heinrich Ritthausen, formerly professor of agricultural chemistry at Königsberg, and a recognized pioneer in the study of the chemistry of proteids, died October 16, 1912, at the age of 87 years.

Miscellaneous.—Sir Sydney Olivier, governor of Jamaica, has been appointed secretary of the Board of Agriculture and Fisheries in Great Britain, vice Sir Thomas Elliott. Stewart Stockman, chief veterinary officer of the board, was given the honor of knighthood January 1.

Harry S. Smith, of the Bureau of Entomology of this Department, has been appointed superintendent of the California State Insectary, vice E. K. Carnes, resigned.

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EXPERIMENT STATION RECORD.

VOL. XXVIII. ABSTRACT NUMBER. No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Principles of biochemistry, C. OPPENHEIMER (*Grundriss der Biochemie. Leipsic, 1912, pp. IV+399, figs. 7*).—This work comprises one of a series of books on the principles of chemistry. The first part of the book deals with the chemical substances contained in the animal body, viz, (1) substances with an open carbon chain, (2) cyclic substances of the animal body, isocyclic bodies and substances having heterocyclic rings, (3) proteins (general and special chemistry), and (4) ferments. Part 2 considers the chemical functions of the tissues and the organism, as follows: (1) Composition of the living substance and nutrients, (2) metabolism, (3) intake and transport of the nutrients, (4) secretion and excretion, and (5) regulation of function, chemistry of the bones, muscles, tendons, cartilage, etc.

Biochemical reactions occurring in light, H. EULER (*Ark. Kemi, Min. och Geol., 4 (1911), No. 2, Art. 8, pp. 1–10, figs. 2; abs. in Ztschr. Bot., 4 (1912), No. 6, pp. 450, 451*).—Attempts were made to determine the chemical changes which took place in small strata of lactic acid held in quartz containers.

When exposed to the ultraviolet rays (uviol lamp) the chief reaction which occurred was found to be a decomposition of the lactic acid into ethyl alcohol and carbon dioxid. The same products were produced when a mixture of acetaldehyde and formic acid was exposed to the same light. In addition to this some condensations took place which under ordinary conditions occur only in an alkaline medium. The author thinks this especially noteworthy, as Buchner and Meissenheimer point out that the condensation of acetaldehyde contributes to the synthesis of numerous plant acids and other substances. The rate of decomposition of lactic acid with the concentrations employed in the experiments was independent of the concentration of the solution.

The origin and significance of starch, E. D. CLARK (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 55–69*).—The discussion includes the formation of starch, its physical and chemical nature, its significance in the plant and to man and animal, and its industrial importance.

Crude fat of Beta vulgaris, A. NEVILLE (*Jour. Chem. Soc. [London], 101 (1912), No. 596, pp. 1101–1104; abs. in Proc. Chem. Soc. London, 28 (1912), No. 401, p. 130; Jour. Soc. Chem. Indus., 31 (1912), No. 10, p. 501*).—The ether extract of the mangel was found to contain triglycerids, free-fatty acids, and two neutral substances which resembled phytosterol and on analysis gave the empirical formulas $C_{31}H_{58}O_2$ and $C_{29}H_{46}O_2$. The free-fatty acids present were

found to consist chiefly of 8.7 per cent of palmitic, 36.1 per cent of oleic, and 18.6 per cent of erucic acids.

Examination of the sap, bark, and seeds of the oleander, A. Feuler (*Jour. Pharm. et Chim., 7. ser., 5 (1912), No. 8, pp. 108–116; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 4, p. 202*).—The bark and seeds, but not the sap, of the oleander contain the toxic glucosid *l*-strophanthin which was previously known as neriin.

Enzyms. O. Cohnheim (*New York and London, 1912, pp. VIII+173*).—These are 6 lectures which were delivered at the University and Bellevue Hospital Medical College, New York City, under the Herter Lectureship Foundation. The contents include methods of obtaining enzyms; the purification of enzyms; the general properties of enzyms; enzyms as catalyzers; the reversible action of enzyms; enzyms and optical activity; mode of action of enzyms; antiferments; specificity of enzyms; zymogens and activators; the individual enzyms; the lipases or steapsins of the alimentary canal; proteolytic enzyms; miscellaneous and vegetable enzyms; the hydrolytic enzyms of tissues, or autolytic enzyms; proteolytic enzyms of blood; proteolytic enzyms of tissues; other hydrolytic enzyms of the blood and tissues; urease and nucleases; the oxidases; the metabolism-enzyms; the fibrin-ferments; and an index of authors.

About some chemical reactions of micro-organisms and their significance for chemical and biological problems, F. Ehrlich (*Orig. Commun. 8. Internat Cong. Appl. Chem. [Washington and New York], 19 (1912), Sect. VIIId, pp. 99–110*).—This is a résumé of work conducted by the author on the biochemical behavior of yeast, fungi imperfecti, bacteria, etc., on various chemical substrats. The author points out that it is now necessary to compare the behavior toward micro-organisms of chemical compounds in addition to carbohydrates.

Investigations in regard to the chemistry and composition of enzyms.—IV, Accustomation of yeast to galactose, H. Euler and D. Johansson (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 3–4, pp. 246–265; Ark. Kemi, Min. och. Geol., 4 (1912), No. 8, Art. 23, pp. 20, figs. 4; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 11–12, pp. 460, 461*).—For the tests in regard to the rapidity with which galactase forms in a yeast, ordinary brewery and culture yeasts were used. The yeasts were initially treated with a sterile Lindner nutrient solution (magnesium sulphate, orthomonopotassium phosphate, asparagin, and sugar). In the beginning the yeast fermented only a very little galactose. The accustomation occurs much more slowly when nitrogen and salts are absent in the nutrient medium.

Formation of invertase in yeast, H. Euler and H. Meyer (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 4, pp. 274–300*).—This is a study of the rate at which invertase is formed in yeast, especially when the yeast is subjected to various kinds of treatment. After treating the yeast with dextrose or sucrose and with either asparagin, glycocoll, or ammonium sulphate the amount of enzym produced in a maximum time of 25 hours was nearly trebled. The carbohydrate in the medium or the source of the nitrogen made little difference as far as inverting power was concerned.

The mode of action of phosphatese, III, H. Euler (*Biochem. Ztschr., 41 (1912), No. 3–4, pp. 215–228; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 587, I, pp. 594, 595*).—The synthesis of dextrose-phosphoric acid ester can take place when subjected to the action of dried yeast extract, provided the dextrose is first submitted to fermentation by yeast, and can take place without the evolution of carbon dioxid. Yeasts differ considerably with regard to the amount of synthesizing yeast enzym extracted by maceration.

Action of peroxid of hydrogen upon lactic acid and glucose, J. Effront (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 20, pp. 1296–1298*).—Hydrogen

peroxid when allowed to act upon lactic acid produces acetic acid and alcohol (from 1 to 5 per cent). When acting upon dextrose the products are acetaldehyde, acetic, oxalic, and formic acids, and alcohol (from 1 to 9 per cent).

A rapid method for the volumetric determination of phosphorus as phosphoric acid, M. Schild (*Chemiste, 3 [1912], pp. 25, 26; abs. in Chem. Abs., 6 (1912), No. 9, p. 1113*).—"The method depends on the fact that, in presence of a colloid, such as glue, the precipitant produced by the action of ammonium molybdate on a phosphate is not yellow and crystal, but white and massy, becoming crystal on warming for a short time. The following solutions are required: (1) Colloid solutions. Mix 1 kg. of ordinary glue with cold water, allow to set, dissolve in hot water containing 250 cc. nitric acid and boil for 2 hours. Make alkaline and precipitate the phosphoric acid formed by means of magnesia mixture and 500 gm. of ammonium carbonate. Make up to 10 liters and set aside, shaking frequently. Remove quantities as required, filter and make acid with nitric acid. (2) Ammonium nitrate solution. Dissolve 10 kg. of ammonium nitrate in 8.5 kg. of common nitric acid, free from chlorin, make up to 50 liters and adjust so that 10 cc. are equivalent to 64.8 cc. of barium hydroxid. (3) Ammonium molybdate solution. Take 5 liters of solution (1), add 10 liters of common nitric acid, then some of a concentrated solution of molybdic acid in ammonium hydroxid, until the precipitate is just redissolved. Set aside for a time, shake frequently, filter, make alkaline, and standardize gravimetrically by means of pure dihydrogen potassium phosphate. The method is as follows: To a boiling neutral solution of the phosphate add 100 cc. of solution (2). Then run in some of solution (3), with constant stirring, until there is no visible growth of the precipitate. Boil, allow to settle and run in more molybdate; repeat this until the approximate end point is reached. Then add exactly 5 cc. of the colloid solution, heat to boiling, allow to settle and add molybdate solution carefully until the end point is reached. If 5 gm. of the original phosphate are used, the burette reading divided by 20 gives the percentage of phosphoric acid (H_3PO_4)."

Estimation of phosphoric acid in the presence of colloidal silicic acid, P. Mélikoff and M. Becaia (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 12, pp. 775, 776*).—If colloidal silicic acid is present in a solution in which phosphoric acid is to be estimated by the usual methods, inaccurate results are obtained, owing to the precipitation of silicomolybdates. With the permolybdate method the results obtained are accurate.

Determination of free carbon dioxid in water by the Trillich method, H. Noll (*Ztschr. Angew. Chem., 25 (1912), No. 20, pp. 998–1005*).—The method devised by Trillich for the determination of free carbon dioxid in water will give correct results if the water in question contains no bicarbonates and the amount of carbon dioxid present is not too high. In the determination of monocarbonate by titrating with sulphuric acid and phenolphthalein the same errors are liable to enter which occur in the determination of free carbon dioxid. The results obtained may be either high or low because the bicarbonates are acid in character toward weak phenolphthalein solutions and alkaline toward a concentrated solution, this being due to the too early or too late dissociation of the phenolphthalein molecule. Some further studies in this direction, using rosolic acid as an indicator, will be made by the author.

The work of Tillmans and Heublein (E. S. R., 26, p. 406) is critically discussed in this article.

Studies on soil humus, S. Leavitt (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 601–604*).—This article reports a further study of methods of determining humus in soils (E. S. R., 23, p. 705), as well as of the chemical nature of the organic matter of the soil. Protein or protein-like substances and a

starch-like body were found in humus. Pentosans were present in appreciable amounts.

The photometric and the colorimetric determination of humus, F. J. ALWAY and R. M. PINCKNEY (*Nebraska Sta. Rpt. 1911, pp. 2–16*).—This is a comparative study between the photometric, the colorimetric, and the official gravimetric methods for humus.

The results show that for Nebraska soils which are very low in humus the colorimetric method is as accurate as, or even more accurate than, the gravimetric method. When soils contain more than 1 per cent of humus the photometric method gives approximate results, providing the necessary precautions are observed, but it can only be used when the humus content of the soil is moderately high. The colorimetric and photometric methods are different modifications of the same method rather than two distinct methods.

Samples found to be rich, intermediate, or poor in humus by the photometric method were usually found to be rich, intermediate, or poor by the gravimetric method, although the samples poor in humus did not have the same ranking, and three gave decidedly lower results by the photometric method. The studies for which the gravimetric determinations were made have been previously noted (E. S. R., 20, p. 111).

The above work was done with Nebraska and Saskatchewan soils. Satisfactory results could not be obtained with desert soils.

On the determination of soil moisture, R. S. TRUMBULL (*Nebraska Sta. Rpt. 1911, pp. 71–73*).—These are some comparative tests carried out in an electric laboratory oven at a temperature of 110° C., and in the oven of an ordinary cook stove. A rapid current of air was passed over the samples contained in the electric oven. The results obtained with the samples in the cook stove in most instances were in fair agreement with those given by the laboratory method, and the cook stove method is deemed satisfactory for practical purposes.

The determination of total manganese in soils, R. A. GORTNER and C. O. ROST (*Nebraska Sta. Rpt. 1911, pp. 74–80*).—This work has been previously noted from another source (E. S. R., 28, p. 111).

The determination of absorbed potassium in the soil, A. G. WABES (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 2, pp. 221–227*).—The amount of potassium which is extracted by various salts, sodium chlorid, barium hydroxid, barium chlorid, ammonium hydroxid, ammonium acetate, and ammonium carbonate is stated. It was found that much depends upon the order in which the solutions are used for extracting the potash.

Diagnosis of the nature of boiled meat by the anaphylaxis reaction, J. MINET and J. LECLERCQ (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 14 pp. 602, 603; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 12, pp. 258, 259*).—In this investigation various kinds of bologna were examined and it was found that the anaphylaxis reaction can be used for detecting meat of various kinds. Boiling or the other processes which enter into the manufacture of bologna have no influence upon the reaction.

Studies in regard to the precipitin reaction for testing seeds, L. K. RELANDER (*Abhandl. Agr. Wiss. Gesell. Finland, 1911, No. 1, pp. 85*).—These investigations, which were conducted with vetch, barley, oats, white lupines, and red clover, indicate that the reaction can be employed for detecting the proteins from various sources. The reaction obtained with the same variety of plants was not always identical. Antibody formation takes place in less time than is usually supposed when vegetable proteins are injected.

The detection of formic acid in fruit products, F. L. SHANNON (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 526–528*).—Although there have

been various methods proposed for the detection of formic acid in foods, the ones mostly used are those depending upon the reduction of silver nitrate and mercuric chlorid. The objection to these methods is that these reagents are also reduced by a variety of other substances. The most satisfactory method, according to the author, is the one which is based upon the reduction of formic acid to formaldehyde with magnesium and dilute sulphuric acid, and the detection of the formaldehyde produced by various methods. A more direct method for detecting formic acid would be by converting it into an insoluble salt, e. g., lead formate, and detecting it by means of the shape of its crystals. Both of the above methods when positive are taken as positive proof of the presence of formaldehyde.

The Benedict sugar test, V. C. Myers (*München. Med. Wchnschr., 59 (1912), No. 27, pp. 1494–1496; abs. in Chem. Abs., 6 (1912), No. 18, p. 2629*).—The qualitative and quantitative methods devised by S. R. Benedict (E. S. R., 25, p. 15) are deemed satisfactory. The results obtained for glucose with the volumetric method compare well with those obtained by Allihn's gravimetric method, the polariscopic method, and Löhnstein's fermentation test.

Lactose in milk can also be determined with the method. For this purpose one part of the milk is mixed with an equal amount of phosphotungstic acid solution (70 parts of acid and 200 cc. of concentrated hydrochloric acid in 1 liter of water) and from 2 to 3 parts of water. After mixing well the solution is filtered until clear. The titration is conducted with Benedict's solution, of which 25 cc. equals 67 mg. of lactose.

Detection of small amounts of glucose (dextrose) and galactose in the presence of lactose, H. Bierry and A. Ranc (*Compt. Rend. Soc. Biol. [Paris], 71 (1911), No. 32, pp. 440, 441*).—In this test, which is a modification of the Tanret, Bierry, Henri, and Ranc methods, the hydrazones of galactose and glucose are separated from lactose by acetic ether which dissolves them and very little of the lactose. The solution containing the glucose and the galactose hydrazones is then freed from the solvent and the hydrazones are converted into the respective osazones. Even in this procedure there is a decomposition of lactose, but it is not more than from 8 to 10 per cent of the total lactose present.

The use of an alcoholic solution of neutral lead acetate for determining gum in sirups, A. C. Chauvin (*Monit. Sci., 5. ser., 1 (1911), I, No. 833, pp. 317, 318*).—This method is as follows:

Five cc. of the liquid containing the gum is placed in a beaker, and 25 cc. of an alcoholic solution of neutral lead acetate (saturated in the cold) added dropwise from a burette with a stopcock amid shaking. The mixture is then filtered through an unfolded filter, the precipitate washed with 95 per cent alcohol, allowed to dry in the air, and weighed.

A modification of the above method is also given.

Determination of gum in sirups, A. C. Chauvin (*Ann. Falsif., 5 (1912), No. 39, pp. 27–33*).—The author now (see abstract above) considers it more satisfactory to precipitate the gum with alcohol and hydrochloric acid. This yields a precipitate which is practically free from ash. Various commercial gums examined were found to contain between 1.7 and 2.9 per cent of ash and 11.5 and 15.8 per cent of water. The method in the present form is as follows:

To 5 cc. of sirup add 5 cc. of hydrochloric acid, 5 cc. of water, and 85 cc. of absolute alcohol. The acid and alcohol are added dropwise amid stirring. The precipitate, after being collected on a filter, is washed with alcohol which contains 10 per cent of hydrochloric acid, then with absolute alcohol, dried, and weighed. The actual amount of gum present in a sirup may be calculated by adding to the weight obtained for the precipitate 16.1 per cent of the weight of the precipitate.

Determination of gum in sirups, X. Rocques and G. Sellier (*Ann. Chim. Analyt., 16 (1911), No. 6, pp. 218–220; abs. in Jour. Soc. Chem. Indus., 30 (1911), No. 13, pp. 823, 824*).—In confirming Chauvin's statement, that gum is completely precipitated with an alcoholic solution by lead acetate, the authors point out that they have employed the method for a number of years in the following form: Twenty-five gm. of the sirup is treated with 80 cc. of 90 per cent alcohol, the first portions of which are added dropwise amid vigorous agitation; then 2 cc. of a saturated alcoholic solution of lead acetate in 95 per cent alcohol is added, and finally 90 cc. of 95 per cent alcohol. The mixture is then thoroughly shaken.

An alternate method consists of taking 20 cc. of the sirup, mixing it with 10 cc. of water, then with 2 cc. of a saturated solution of lead acetate in 95 per cent alcohol, and following this with 90 cc. of 95 per cent alcohol, and shaking. In both instances the mixture is allowed to stand for 20 minutes, the precipitate collected on a tared filter, washed with 75 per cent alcohol, dried, and weighed. The filter and contents are then incinerated with the aid of fuming nitric acid and the residue obtained weighed. The difference between the weights will represent the pure gum, and this value when multiplied by 100/85 will give the actual gum in the sirup, since gum arabic was found to contain about 85 per cent of pure gum.

A modification of the Sweeney method for crude fiber, Cornelia Kennedy (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 600, 601*).—The Sweeney method, reported in Bulletin 137 of the Bureau of Chemistry of this Department (E. S. R., 25, p. 507), was not found entirely satisfactory for determining the fiber in all feeding stuffs, and especially in those rich in protein. This was due to the fact that the acid used dissolves nitrogenous bodies, gums, pentoses, etc. These are precipitated when the alkali solution is added and finally weighed as crude fiber.

"The following modification of the Sweeney method does away with this difficulty and gives results which check, within the limits of error, with the official method. As in the above method, the prepared sample is first boiled with 200 cc. of a 1.25 per cent sulphuric acid. Neutralization is done away with by making the alkali solution of such strength that it both neutralizes the acid and leaves the 400 cc. of 1.25 per cent sodium hydroxid: 200 cc. of boiling 3.52 per cent sodium hydroxid are therefore added, and the whole boiled 30 minutes. The solution and fiber are then thrown onto a linen filter (which works more rapidly than a Gooch because of the nature of the solution) and washed free of akali. (Suction may be used to cause a more rapid filtration.) The fiber is then thoroughly washed with boiling 1.25 per cent sulphuric acid, which will remove the material precipitated by the addition of the alkali, washed free of acid, removed from the linen filter to a crucible, dried, weighed, incinerated, and reweighed. The Sweeney method has a great advantage over the official method by doing away with a filtration and thus saving time. This advantage is preserved in the modification of the Sweeney method."

Benzoic acid as an acidimetric standard, G. W. Morey (*Jour. Amer. Chem. Soc., 34 (1912), No. 8, pp. 1027–1031*).—It was noted that benzoic acid could be titrated with a standard alkali solution to a great degree of accuracy, and its use as a standard for calibrating standard solutions is recommended. See also a previous note by Phelps and Weed (E. S. R., 21, p. 610). The method used in the study of this problem was that of standardizing a solution of hydrochloric acid by several well-known and standard methods.

Error in the Babcock butter fat test of fresh milk caused by improper diameter of test bottle necks, T. C. MANCHESTER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *15* (*1912*), *Sect. VII, pp. 179–185*).—The data presented in this paper show that the average 10 per cent Babcock milk test bottle introduces an error in the result on account of the diameter of the neck being too large. "The milk test bottles at present specified by the Official Agricultural Chemists are 'Babcock milk test bottles graduated to 10 per cent,' no restriction being made as to the length of graduation." "It is seen that the error introduced when the length of graduation (0 to 10 per cent) is 60 to 65 mm., is approximately 0.1 per cent; when the length of graduation is 45 to 50 mm., the error is approximately 0.2 per cent; when the length of graduation is 22 mm., the resulting error is approximately 0.55 per cent. Bottles with a length of graduation (0 to 10 per cent) of 80 mm., are seen to be practically free from error."

A method for eliminating this source of error is suggested.

An improved method for preparing milk sera and the use of the same in examining milk, B. PFYL and R. TURNAU (*Arb. K. Gsndhtsamt., 40* (*1912*), *No. 3, pp. 245–304*).—The method consists of treating 50 cc. of the milk in question with 5 cc. of carbon tetrachlorid and 1 cc. of a 20 per cent solution of acetic acid, shaking for a few minutes, and centrifuging for the purpose of obtaining a sediment of protein, etc. Where it is desired to remove the albumin and globulin the milk may be boiled for 20 minutes under a reflux condenser. The method has the advantage over the Ackermann calcium chlorid method of yielding a serum which keeps much of the mineral substances in solution.

Comparative tests were made with the following methods for preparing serum: Calcium chlorid serum according to Ackermann; asaprol serum according to Baier and Neumann; spontaneous serum; serum containing albumin and globulin with acetic acid according to Burr, Berberich, and Lauterwald; albumin and globulin containing acetic acid serum according to Stüber; acetic acid serum, free from coagulable proteins, but without carbon tetrachlorid; and lead serum used in testing for peroxidases in milk according to Rothenfusser. The tetrasera were clearer than those produced spontaneously by calcium chlorid and the ordinary acetic acid serum, but were practically the same as the asaprol serum and could be used directly for polarizing purposes, and in the peroxidase tests. The refractions of these sera were about 2° higher than those obtained by the calcium chlorid method. Acetic acid and carbon tetrachlorid had no effect upon the refraction. The difference in refraction between a tetraserum which contained coagulable proteins and a second tetraserum was from 1.5 to 3°. The addition of 0.25 cc. of a 15 per cent calcium chlorid solution to 30 cc. of milk, as advised by Ackermann, had an effect upon the refraction. The total nitrogen content of tetraserum No. 1 was about the same as that in spontaneous serum, while in tetraserum No. 2 (free from coagulable proteins) it was about as high as that of the calcium chlorid serum, but higher than the asaprol serum, which yielded the lowest results. The acetic acid serum varied in its protein content according to the coagulation temperature employed. The refraction and specific gravity of the 2 tetrasera were found to run parallel.

In addition to the above the influence of method and time of milking, feed, period of lactation, individuality, breed, health of animals, heating the milk, addition of substances to the milk, preservatives, water, etc., upon the results obtained with the method, are considered. The method can also be used in conjunction with testing for nitrates, nitrites, ammonia, boiled milk, patho-

logically and physiologically changed milks, and for determining the amount of sugar in milk.

Detection of benzoic acid in margarin, butter, and other fats, W. FRIESE (*Pharm. Zentralhalle, 52 (1911), No. 45, pp. 1201–1203; abs. in Chem. Abs., 6 (1912), No. 6, p. 781; Chem. Ztg., 36 (1912), No. 9, Repert., p. 40*).—"Mix 100 gm. of the sample with 25 cc. of 20 per cent sodium carbonate solution added in 5 portions during 5 minutes, and heat on the water bath until the fat is melted. Cool on ice, decant off the liquid through an opening made in the solid fat, and wash out with water. Add cold barium chlorid solution in excess, filter, remove the barium with sulphuric acid, extract the clear filtrate with ether, and detect the acid in the residue left on evaporation. An extensive list of references follows."

Methods for the chemical analysis of feeding stuffs, O. HOFMAN-BANG and H. G. SÖDERBAUM (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 4, pp. 280–293*).—This is a description of the methods of analysis used in the chemical laboratory of the Central Experiment Station in Sweden. It includes taking of the sample, and determinations of water, ether extract, total, albuminoid, and cleavable nitrogen, crude cellulose, pentosans, sugar, starch, and mineral constituents.

On the relation between the Kirschner and Polenske values for margarins containing coconut or palm-kernel oils, E. R. BOLTON, H. D. RICHMOND, and C. REVIS (*Analyst, 37 (1912), No. 434, pp. 183–189*).—In a previous communication (E. S. R., 25, p. 808) it was pointed out that the determination of the Kirschner value would enable one to detect the presence of small quantities of butter fat in mixtures containing coconut oil, and furthermore that it would furnish a reliable figure for estimating the percentage of coconut fat when butter fat was absent. As a somewhat irregular curve was obtained when the mixture contained butter fat up to 10 per cent and practically a straight line when butter fat was absent, the authors reinvestigated that point and found that the irregular curve was due to the fact that the values obtained for mixtures containing up to 15 per cent coconut oil were carried out with an Irish butter which had a very low Reichert-Meissl number. As a result of the present investigation the following deductions were made:

"On the values obtained both for coconut and palm-kernel oils, it was seen that the Polenske value was practically independent of the amount of butter fat present, when present up to 10 per cent in the mixture, and is practically dependent on the presence of the coconut or palm-kernel oil only. The mean value was therefore calculated from the four values obtained for mixtures corresponding to each different percentage of coconut or palm-kernel oil and on platting these mean values a regular curve was obtained. The following equations have been worked out for these 'mean value' curves: x (coconut oil) $=12.3(P-0.45)^{0.747}$; x (palm-kernel oil) $=16.72(P-0.45)^{0.895}$; where x=the percentage of coconut or palm-kernel oil [and P=Polenske value].

"The authors therefore point out that the Polenske value acts as an 'indicator,' so that, when a margarin containing coconut or palm-kernel oils is examined by the Reichert-Meissl-Polenske-Kirschner process, reference to this mean curve at once determines the percentage of coconut or palm-kernel oil apart from other values. The corresponding Kirschner value obtained from the typical curve then determines the presence or absence of butter fat, the Reichert-Meissl value acting as a confirmatory figure, and controlling the small fluctuations which may occur in the Kirschner value occasioned by a variation in butyric acid content of different butters."

Process for obtaining starch from potatoes and the like, H. TRYLLER (*German Patent 242,168, Sept. 21, 1910; abs. in Jour. Soc. Chem. Indus., 31 (1912),*

No. 10, p. 505).—"The potatoes or the like are grated, mixed with water, ground in a ball mill, and then projected against a sieve or screen, the pulp which does not pass through the screen being returned to the ball mill and the operations repeated. In the apparatus described, the ball mill consists of a drum constructed in segments which overlap so as to form a number of scoops. The drum rotates in a trough containing the grated potatoes and water, and, by the action of the scoops, the pulp is partly forced through openings into the interior of the drum where it is ground by the balls, and partly projected against a screen, through which the starch milk flows."

The canning and preserving of fruits and vegetables in the home, G. W. CARVER (*Tuskegee, Ala., 1912, pp. 8*).—This publication deals with the canning of corn, string beans, okra, eggplant, English peas, Lima beans, tomatoes, parsnips, carrots, pumpkins, squash, sauerkraut, sweet potatoes, blackberries, huckleberries, grapes, peaches, strawberries, pears, apples; the drying of some of the fruits, etc., mentioned above; making jellies; and pickling cucumbers, cantaloups, citron, watermelon rinds, green beans, cabbage, and green tomatoes.

Enological investigations, F. T. BIOLETTI and W. V. CRUESS (*California Sta. Bul. 230, pp. 23–118, figs. 8*).—This bulletin is an attempt to popularize the use of sulphurous acid and pure yeast cultures in wine making and to clear up some of the uncertainties regarding their use. Tests were made for the purpose of determining the function of sulphurous acid, to what degree injurious micro-organisms could be eliminated from the wine yeast, and the best method for handling the pure culture yeast, and the amount of yeast to be used for pitching.

The average absorption of sulphurous acid in a 2,600 cc. bottle was as follows: By water 88.8 mg., must 56.7 mg., and wine 154 mg. "The percentage of sulphurous acid absorbed in the barrels was greater on the average than in the glass bottle, owing no doubt to the relative greater surface exposed in the wooden containers, due to the inequalities of the surface and pores of the wood. The film of water in the pores, etc., absorbs the sulphurous acid rapidly."

The disappearance of active, free sulphurous acid from must and other solutions was studied with grape and raisin must, and with solutions of tartaric acid in water. The greatest retention was noted with the must from raisins, in which the amount is apparently a function of the amount added originally.

Tests in a winery to see how nearly the changes in form and amount of sulphurous acid found in laboratory tests corresponded with the actual changes in practice indicated that the disappearance and changes in the form of the sulphurous acid present were much less in wine than in must. "When free sulphurous acid is added to must in the quantities usual in wineries either in the form of gas, liquid, or sulphite it decreases very rapidly at first. The total sulphurous acid also decreases, but with less rapidity. The combined sulphurous acid, on the contrary, increases rapidly at first, the rate of increase gradually slackens, then ceases, and finally this form also decreases."

"The final loss of sulphurous acid, shown by the decrease in total, takes place in two ways. Part is volatilized and escapes into the atmosphere, part is oxidized to sulphuric acid [and remains in the wine]. At first the volatilization is rapid and is the principal cause of the loss shown by the steepness of the curve shown. The escape of gaseous sulphurous acid from a recently sulphited vat is readily recognized by its strong odor. During fermentation the decrease becomes slower, owing probably to a slackening or cessation of the vaporization. After fermentation the decrease is further diminished owing to the cessation of vaporization and a diminution in the rate of oxidation. In the wine after fermentation, the decrease of total and of combined sulphurous

acid is identical. This probably means that as fast as the free sulphurous acid is oxidized it is renewed by the setting free of an equivalent amount of the combined forms. The increase of sulphates in the wine due to sulphiting is very small."

Laboratory tests having shown that fermentation will not start until the amount of sulphurous acid has fallen to the neighborhood of 30 to 50 mg. per liter, some further tests were made with regard to the effect of acidity, sugar, limpidity, and heating. Tartaric acid increased the inhibiting power of sulphurous acid, "and this explains in part the need of larger amounts in overripe grapes in which little free tartaric acid exists."

Heating to 100° C. had no influence on decreasing the effect of the sulphurous acid and on the contrary seemed to delay the fermentation. "Heating under pressure to 120° for an hour, however, had a noticeable influence on decreasing the effect of the sulphurous acid added subsequently."

"Very ripe grapes require more sulphurous acid than those which are less ripe both because they are more liable to bacterial attack and because they neutralize more of the antiseptic effect of the sulphurous acid."

Free sulphurous acid was found to be about 30 times as efficient for killing yeast as the combined form. "Exposure to 300 mg. per liter of free sulphurous acid will kill wine yeast in 24 hours. About 50 mg. per liter of free sulphurous acid will prevent fermentation with wine yeast. Free sulphurous acid is about 60 times as effective in preventing fermentation as combined sulphurous acid. Very small amounts of sulphurous acid (5 oz. of potassium metabisulphite per ton in most cases) are sufficient to prevent all growth of molds and wild yeast and to insure a pure fermentation when a starter of wine yeast is used. One hundred mg. of sulphurous acid per liter (6 oz. of potassium metabisulphite per ton(eliminate over 99.9 per cent of the active cells of micro-organisms from the must. Wine yeast does not become inured to sulphurous acid, but, on the contrary, exposure increases its sensibility. The reputed training of yeast to withstand sulphurous acid is a fallacy. Wine yeast is less sensitive to sulphurous acid than any of the common yeasts, molds, or bacteria occurring in grapes and wine. By properly timing the sulphiting and the addition of the starter the full effect of the maximum amount of free sulphurous acid is exerted on the injurious organisms and the yeast is exposed only to the minimum amount of free sulphurous acid." . . .

"Favorable results from the use of pure yeast in wine making were obtained by the station 19 years ago. Pure yeast has been used regularly with success for many years in several Californian wineries. The necessity of a proper selection of yeast has been demonstrated. Champagne and Burgundy yeasts have been found especially suitable to Californian conditions. Grapes from all regions investigated, whatever their variety, condition, or stage of ripeness, showed large numbers of mold spores and wild yeasts. The wine yeast was never present in large numbers and was usually outnumbered many thousand times by the injurious micro-organisms.

"Solid cultures of pure yeast were found more stable and reliable than liquid cultures. Direct application of the pure yeast received from a laboratory involves the buying and transporting of large amounts and is too expensive. The previous preparation of a starter from a small culture received from a yeast laboratory is preferable. With a little practice and care any intelligent wine maker can prepare a starter. A starter should be used when it has its maximum efficiency, which is about the stage at which the Balling degree has been reduced one-half. The efficiency does not diminish much until all the sugar has disappeared. Expensive and complicated yeast propagators are unnecessary in wineries. A simple and cheap apparatus [which is illustrated] can be devised

suitable for wineries of any size and requiring the labor of only one man in the largest winery."

In addition to the above the use of sulphurous acid and of pure yeast without the aid of cooling appliances was tested in a small winery. "The growth of molds and wild yeasts was completely prevented by the use of sulphurous acid. Large quantities of sulphurous acid in white wine making, even with grapes in very bad condition, were found unnecessary and inadvisable. The yeast apparatus used was satisfactory and insured practically pure fermentations. Sulphurous acid and pure yeast can be used to insure the completion of fermentation and to prevent 'stuck' wines even without cooling devices if the wine is handled in small casks. In large casks and vats where the end fermentation is often slow the use of sulphurous acid much decreased the danger of bacterial deterioration. The volatile acidity is uniformly lower in the sulphited wines. The fixed acidity is protected by the use of sulphurous acid and the sulphited wines show a higher total acidity than the others. The use of sulphites gave an increase in the alcohol of the wines of about 1 per cent. The color of the sulphited red wines was improved in both tint and intensity. The treated wines cleared more rapidly and showed sounder sediments. The amount of sulphurous acid remaining in the wines was much below the legal limitation except where unnecessarily large amounts were used."

The legal aspects in regard to the use of sulphurous acid are also discussed.

The ripening of hops, C. E. Bradley and H. V. Tartar (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 591, 592*).—This is a study of the composition of the hop cone at different stages of the ripening period.

"The results show that there is a continuous increase in the amount of soft bitter resins throughout the ripening period. The riper the hop the richer it is in these substances, and if high soft bitter resin content is a criterion of brewing value, the fully ripened hop is much to be preferred. The ratio of the amount of α-bitter resin to the amount of β-bitter resin is of interest. On August 11, the ratio was 1:3.48, while on September 26, it was 1:1.30. Between the first picking and the last, the amount of α-bitter resin increased 450.5 per cent, while the β-bitter resin increased but 167.8 per cent. There seems to be no marked change during the ripening period in the amount of resin, wax, and tannin. From the analytical data, there is also no evidence that one constituent changes to the form of another during the process of ripening."

METEOROLOGY—WATER.

Climate and weather, H. N. Dickson (*London [1912], pp. 256, pls. 4, figs. 10*).—The subject is discussed in nontechnical language. An introductory chapter deals with general principles and conditions, others treat of the physical properties and conditions modifying the atmosphere, the planetary circulation of the atmosphere, the influence of land and sea upon the atmosphere, the monsoon climatic region, tropical climatic regions, subtropical and temperate climatic regions, climate and vegetation, and climate and man. The last two chapters emphasize especially the need of more careful study of climate with reference to better adaptation of plant growth to it.

A short note on the literature of the subject is added.

On a period of 33.33 years in the earth's climate, and its connection with sun spots, J. Zilius (*Weltall, 12 (1911), No. 3, pp. 33–42; abs. in Amer. Jour. Sci., 4. ser., 34 (1912), No. 201, p. 308*).—From data for deficiency and excess of rainfall at Paris, Prague, Madras, and Bernaul, the author shows a maximum of dryness in 1833–34 and 1866–67. "These agree with minima of sun spots at 1,833.3 and 1,866.8, and these in turn coincide with the displays of the Leonids or November meteors."

Evaporation from the soil and plants as a factor in the persistence of rainy and cold weather, A. MÜNTZ (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 11, pp. 519–521; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 12, p. 376*).—Observations made at Bellevue, France, during 1910 and 1912 tend to show that evaporation at the surface of the soil, especially that due to growing plants, is an important, perhaps a predominant, factor in prolonging cloudy and rainy periods by a sort of continuous cycle of evaporation from the soil to the air and return to the soil by precipitation from the air. A lowering of temperature during these periods is due to the same causes. Wet soils from which evaporation was rapid were from 2 to 3° colder than the same soil with normal moisture which was evaporating slowly. Air circulating among the leaves of alfalfa was 3° colder than that above. The heat removed from the soil by evaporation is not returned in the rain but escapes into the higher regions of the atmosphere and the rain returns to the soil from 3 to 4° colder than the surrounding air.

The annual rainfall and temperature of the United States, G. A. LINDSAY (*Trans. Acad. Sci. St. Louis, 21 (1912), No. 2, pp. 71–78, pl. 1*).—This paper gives in brief the results of an attempt "to compute the total precipitation on the main body of the United States, exclusive of Alaska, and the outlying possessions; and also to find the average annual temperature of the same region as a whole." The data used covered the years 1891 to 1904.

The author concludes "that, taking the 14 years as a basis, the average annual temperature of the United States, excluding the outlying parts, is 52.9° F., and the annual precipitation is 1,308 cubic miles.

"The State having the lowest amount of precipitation in any year was Arizona in 1894, 5.8 in.; the greatest, Alabama in 1910, 71.6 in. The State having the lowest average temperature was North Dakota in 1893, 35.5°; the highest, Florida in 1897, 71.8°. These, of course, are far from representing the extremes for small areas."

The author was not able with the data dealt with to trace any periodicity of rainfall and temperature or correlation with celestial phenomena such as sun spots.

The relation between climatic conditions and plant distribution in the United States, B. E. LIVINGSTON and F. SHREVE (*Johns Hopkins Univ. Circ., n. ser., 1912, No. 2, pp. 19, 20*).—This is a preliminary note on an elaborate compilation and calculation of the available data on climatic conditions and plant distribution in the United States, prepared for the Carnegie Institution of Washington, in which "the ranges of the main vegetational types and the climates of the areas covered by these ranges have been defined as far as possible. . . .

"The general type of vegetation (whether coniferous forest, chapparal, desert, grassland, prairie, or deciduous forest) appears clearly not to be related to the temperature conditions of the area occupied; each type occurs both north and south, and the various climatic contours which depend upon temperatures, extending as they do in a generally west-east direction, intersect the areas of the different vegetational types without any obvious relation to the form and position of these areas.

"On the other hand, the climatic contours that depend upon moisture conditions (evaporation, rainfall, humidity, and various combinations of these and of these with other factors) exhibit a striking relation to the position and form of the limiting boundaries of our vegetational areas."

The results emphasize especially "the importance of evaporation as a compound climatic factor which approaches more nearly to furnishing a criterion of vegetational possibilities than any other which is readily measured."

Rainfall and the wheat yield, T. PASCOE (*Jour. Dept. Agr. So. Aust., 16 (1912), No. 3, pp. 292–295*).—A comparison is given of rainfall at Adelaide and wheat yields in South Australia for 1880 to 1911, and the conclusion is drawn that with improvement of methods of culture the yields are less dependent upon rainfall than formerly.

The mean annual rainfall of Scotland, 1871–1910, A. WATT (*Jour. Scot. Met. Soc., 3. ser., 15, No. 28, pp. 273–294, pl. 1, figs. 2; abs. in Nature [London], 90 (1912), No. 2245, p. 289*).—The available data are summarized and discussed.

Meteorological observations at the Ploti Experiment Station, 1911, M. MARTYNOV (*Godichnyĭ Otchet Ploti. Selsk. Khoz. Opytn. Stantsii, 17 (1911), pp. 1–58, 245–252*).—The observations recorded and discussed included precipitation (rain and snow); evaporation; humidity, temperature, and pressure of the air; temperature of the soil; cloudiness; solar radiation; and casual phenomena.

An attempt is made to correlate the meteorological conditions of the year with plant growth. As a result of a warm autumn plants entered the winter in vigorous condition but were injured especially by the extreme daily variations of temperature, without snow cover, in February.

Meteorological, magnetic, and seismic observations of the College of Belen of the Society of Jesus, Havana, 1911, L. GANGOITI (*Observatorio Meteorologico, Magnetico y Seismico del Colegio de Belen de la Compañía de Jesus en la Habana, año de 1911. Havana, 1912, pp. 97, pls. 3*).—Detailed reports, largely tabular and diagrammatic, of the usual observations.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 5 (1912), pt. 2, pp. 83–159, figs. 46*).—This number contains the following articles: Atmospheric studies (illus.), by J. W. Sandström; and The Diurnal Variations of Atmospheric Pressure (illus.), by W. J. Humphreys.

The composition of the atmosphere with special reference to its oxygen content, F. G. BENEDICT (*Carnegie Inst. Washington Pub. 166, 1912, pp. 115, pl. 1, fig. 1*).—A history of air analysis and a description of the apparatus used by different experimenters are given. Experiments with the Sondén apparatus are described, and as a result of 3 years of experiments with this type of apparatus it is believed that at any one place the oxygen content of the air is constant, being independent of weather conditions, humidity, temperature, barometer, wind direction, etc.

[Heating and ventilation], L. HILL (*Nature [London], 90 (1912), No. 2240, pp. 146–155; Heating and Ventilating Mag., 9 (1912), No. 11, pp. 11–15; Mining and Engin. World, 37 (1912), No. 16, pp. 713, 714*).—An address before the British Association at Dundee.

Present methods of ventilation and overheating are adversely criticised, and it is said that "all efforts of the heating and ventilating engineer should be directed toward cooling the air in crowded places and cooling the bodies of the people by setting the air in motion by means of fans." The essentials of a good ventilating system are "(1) movement, coolness, proper degree of relative moisture of the air; (2) reduction of the mass influence of pathogenic bacteria." No importance is attached to considerable variations from the normal chemical composition of the air.

Stuffy rooms, L. HILL (*Pop. Sci. Mo., 81 (1912), No. 4, pp. 374–396*).—The discomfort and menace to health of stuffy rooms is ascribed mainly to air and heat stagnation and germ infection, not to changes in chemical composition. "Leaving on one side those gross chemical impurities which arise in mines and in some manufacturing processes, and the question of bacterial infection, the alterations in chemical composition of the air in buildings where people

crowd together and suffer from the effects of ill-ventilation have nothing to do with the causation of these effects. . . .

"The increased percentage of carbonic acid and diminution of oxygen which has been found to exist in badly ventilated churches, schools, theaters, barracks, is such that it can have no effect upon the incidence of respiratory disease and higher death rate. . . . The conditions of temperature, moisture, and windless atmosphere in such places primarily diminish the heat loss, and secondarily the heat production, i. e., the activity of the occupants, together with total volume of air breathed, oxygen taken in, and food eaten. The whole metabolism of the body is thus run at a lower plane, and the nervous system and tone of the body is unstimulated by the monotonous, warm, and motionless air. . . . The number of pathogenic organisms is increased in such places, and these two conditions run together—diminished immunity and increased mass influence of infecting bacteria."

Weather and water, M. HOFFMANN (*Jahresber. Landw., 26 (1911), pp. 1–21*).—Recent investigations on this subject are classified and reviewed.

Study of an artesian water of Argerich, Argentina, P. LAVENIR (*An. Min. Agr. Argentina, Lab. Quím., 2 (1912), No. 3, pp. 14*).—A detailed chemical study of this water is reported with a discussion of its suitability for domestic use and irrigation. An analysis is also given of the sinter deposited by the water.

Domestic water supplies for the farm, M. L. FULLER (*New York and London, 1912, pp. X+180, pls. 8, figs. 49*).—The importance and difficulties in the way of securing a sufficient and safe supply of water on the farm are pointed out.

"It is the object of this little book to explain to the agriculturist something of both the advantages and dangers of the common sources of domestic water supplies, including surface waters, springs, and underground waters, and to point out to him the danger signals and indicate the steps to be taken to safeguard his supplies."

Different chapters treat of sources of water, surface waters, springs, ground waters and their occurrence, water-bearing formations, sources and safety of underground supplies, location and movements of underground waters, artesian flows, water provinces of the United States, types of wells, dug wells, bored and punched wells, driven and jet wells, deep wells, special problems, cost of drilling and casing, methods of raising water, peculiarities of behavior of wells, cisterns and house tanks, farm waterworks, composition and testing of well waters, and purification of water supplies.

A very powerful ultraviolet-ray lamp and its use in the sterilization of large quantities of water, V. HENRI, A. HELBRONNER, and M. DE RECKLINGHAUSEN (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 18, pp. 852–854*).—A 500-volt lamp is described and comparisons of it with the ordinary 110 and 220-volt lamps are reported. Its abiotic and sterilizing action was from 55 to 60 times greater than that of the 110-volt lamp, and 4.6 times more efficient as regards electricity consumed.

Sterilization of drinking water by means of ultraviolet rays, SCHROETER (*Ztschr. Hyg. u. Infektionskrank., 72 (1912), No. 2, pp. 189–212*).—The author reaches the conclusion from his studies of this subject that sterilization by means of ultraviolet rays is complete only in case of very clear waters. The quartz mercury-vapor lamp was found to be very sensitive to external influences, difficult to manage, and to operate for a relatively short period. The use of the mercury vapor lamp for household purposes can not always be depended upon to furnish sterile water and is very expensive. It gives no better results than other methods which have been proposed.

A bibliography of 42 references to the literature of the subject is given.

Disinfection of drinking water by means of minimal amounts of chlorid of lime, A. I. ANTONOWSKY (*Ztschr. Hyg. u. Infektionskrank., 72 (1912), No. 3, pp. 421–443*).—From experiments here reported the author concludes that the principal agent in the disinfection of drinking water by means of neutral chlorid of lime is the oxygen and that directions based upon the content of active chlorin have only a relative value. Sulphate of soda reduces the action of the chlorid of lime while catalyzers such as hydrogen peroxid and manganese peroxid increase it.

British practice in sewage disposal, A. J. MARTIN (*Engin. Rec., 66 (1912), No. 18, pp. 496–498*).—This is a brief review of the history and present status of sewage disposal in Great Britain. Reference is made to the fact that land treatment has been long and widely practiced, but has been superseded in many cases by other methods where land conditions are not suitable. Sludge is usually buried or discharged into the sea. At Bradford, where the sewage contains a large proportion of wool scourings, the sludge grease is extracted and is a considerable source of revenue (amounting to from $100,000 to $150,000 in 1911) and the extracted sludge is sold as a fertilizer for about $3.50 per ton.

SOILS—FERTILIZERS.

On the sampling of prairie soils, F. J. ALWAY and R. S. TRUMBULL (*Nebraska Sta. Rpt. 1911, pp. 35–51*).—Determinations of the nitrogen and humus contents in a large number of samples of prairie soils from different sections of Nebraska are reported to illustrate the difficulty of securing representative samples of prairie soils showing their true composition in comparison with cultivated soils which undergo constant stirring and mixing, and are, therefore, more uniform in texture and composition. The results show the marked variations in composition with slight variations in texture, depth of sampling, and number of samples used in the composite. The error was reduced by increasing the number of samples in the composite.

On the sampling of cultivated soils, F. J. ALWAY and E. K. FILES (*Nebraska Sta. Rpt. 1911, pp. 52–55*).—In connection with the work noted above individual and composite samples of soil, taken at various depths from fields of alfalfa and of brome grass, were analyzed for nitrogen to determine the variation in results due to sampling. The results showed the importance of using large numbers of individual samples in making the composites.

The mineral constituents of some soils of the eastern Nebraska loess, F. J. ALWAY and E. K. FILES (*Nebraska Sta. Rpt. 1911, pp. 17–34*).—Determinations of the mineral constituents of a large number of samples taken at different depths in three widely distributed types of loess soil are reported and discussed.

"From the analyses of surface soils it is evident that it is futile to attempt to find differences in the amount of the mineral constituents which have been caused by cultivation, unless the samples analyzed are composites of at least a very large number of individual samples."

Analysis of a Florida clay, A. A. HALL (*Proc. Univ. Durham Phil. Soc., 4 (1911–12), No. 4, pp. 228, 229*).—Analyses are reported of samples of a clay subsoil underlying peat from Duval County, Florida, and of a typical clay underlying coal. The former contained more iron, sodium, potassium, and especially phosphorus than the latter, and "represents a poor soil, but one which is still capable of supporting vegetable life."

The cut-over lands of south Mississippi, E. B. FERRIS (*Mississippi Sta. Bul. 160, pp. 27, figs. 2*).—This bulletin gives information as to the climatic and health conditions and agricultural possibilities of these lands as based on the

work of the McNeill substation, including analyses of typical samples of pine-leaf soil from the station field, and a somewhat detailed discussion of the fertilizer requirements and crop adaptation of these soils.

The analyses, as well as fertilizer tests, showed the need of phosphoric acid in both the soil and subsoil. The potash content, although less than that of other soils of the State, was found to be relatively high, and little increase in crop production resulted from the use of potash fertilizer. However, some benefit, probably indirect, from potash fertilizers was observed, especially with crops that are subject to fungus diseases. "Nitrogen is necessary even on freshly cleared lands here, and must from the start be supplied either with commercial fertilizers or by growing leguminous crops."

The crops which have been grown with profit on these lands are cotton (when situated far enough from the coast), corn, Texas Red Rust Proof oats or closely related varieties, a number of summer legumes, sugar cane, and fruits and vegetables. Sugar cane is stated to be excellently adapted to this section, being grown chiefly for sirup (E. S. R., 23, p. 40).

Soil survey of the Clarksburg area, C. N. MOONEY and W. J. LATIMER (*W. Va. Geol. Survey, County Rpts. 1912, pp. 661–695, map 1*).—This is a report of a soil survey, including a soil map of Doddridge and Harrison counties, conducted in cooperation with the Bureau of Soils of this Department. Mechanical analyses of the soil are reported.

The area consists of an original high plateau cut by stream valleys. Exclusive of areas of stony land, 11 types of soil were mapped in the area. These may be divided into 2 classes according to origin, (1) residual soils and (2) transported or sedimentary soils. The Meigs clay loam is the most extensive type in the area, covering most of the uplands of Doddridge and of western Harrison counties. It has a steep and broken topography and is used largely for pasture or forest purposes. "Stock raising is the leading industry of the farm, the land being in most places too hilly for successful cultivation. Grasses and hay are the principal crops. On cultivated areas corn, oats, some wheat, and vegetables are the chief products."

English work on pasture soils, C. T. GIMINGHAM (*Internat. Mitt. Bodenk., 2 (1912), No. 2–3, pp. 245–257*).—Investigations by the Rothamsted Experimental Station of herbage from good and from scouring fields are cited to show that ordinary chemical analysis of the soil "has not revealed anything that could account for the observed effects," and that mechanical analysis, according to our present methods, is not of the same value in the study of pasture soils as it has proved to be in the case of arable soils, probably because of the influence of organic matter in the pasture soils.

A study of the physical geography and agrology of Macedonia and Epirus, P. ROLLEY and M. DE VISME (*Ann. Inst. Nat. Agron., 2. ser., 10 (1911), No. 2, pp. 375–447, pl. 1, figs. 25; 11 (1912), No. 1, pp. 5–75, figs. 18; abs in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 1927–1929*).—The origin, composition, characteristics, and agricultural value of various soils of these regions are discussed. The alluvial soils are the most important agriculturally. These "are mostly fertile, heavy, compact, and somewhat impermeable, and require systematic improvement to a greater or less extent."

The nitrogen content of some Nebraska soils, F. J. ALWAY and E. S. BISHOP (*Nebraska Sta. Rpt. 1911, pp. 129–144, fig. 1*).—Nitrogen determinations in samples of loess, glacial drift, high plains, and sand hills soils from different parts of Nebraska showed a variation of 0.018 to 0.306 per cent in the surface 6 in. "Some of the samples of low nitrogen content are from

unproductive soils, while others low in nitrogen are from soils of long maintained productivity."

The relative amounts of nitrogen, carbon, and humus in some Nebraska soils, F. J. ALWAY and C. E. VAIL (*Nebraska Sta. Rpt. 1911, pp. 145–163*).—A study of the ratio of organic carbon to nitrogen and to humus, and of humus to nitrogen in samples of cultivated and prairie soils at different depths from different sections of the State is reported.

The main conclusions from the results are that "the percentages of nitrogen, carbon, and humus decrease from the surface downward. They are lower in the surface 6 in. and in the surface 12 in. of cultivated fields than in similar depths of the adjacent prairies.

"The carbon-nitrogen ratio decreases through the first 3 ft. of the upland prairies, but in the case of the lowland field it remains constant until the black soil has been passed through. . . . In the case of the surface 6 in. or 12 in. of prairies the highest ratio found was 12.7 and the lowest 10.2. . . . In samples taken to a depth of 6 in. the ratio was, in general, lower in the case of the cultivated fields than in the adjacent prairies. With the samples taken to a depth of 12 in. the ratio was markedly lower in the cultivated fields.

"With the samples from different foot sections the humus-nitrogen ratio was found to decrease from the surface downward except in the lowland fields. . . . The carbon-humus ratio . . . appears, in general, to be slightly lower in the surface soil of cultivated fields than in that of adjacent prairies.

"The ratios for the surface soil are so nearly constant that one can satisfactorily estimate the carbon content from a nitrogen determination, thus rendering a carbon determination unnecessary for practical purposes. The actual humus determiation for soils from a part of the State from which similar soils have been analyzed may well be omitted and the percentage of humus estimated from the nitrogen content."

Some notes on the alfalfa and clover residues as sources of soil nitrogen, F. J. ALWAY and E. S. BISHOP (*Nebraska Sta. Rpt. 1911, pp. 56–65, fig. 1*).—Determinations of the relative proportions and nitrogen content of the roots for different depths and the aerial portions of clover and of alfalfa plants, the nitrogen content of alfalfa residue remaining on the field, and the comparative nitrogen contents of soils from corn and from alfalfa fields are reported.

In observations made on the station farm it was found that the roots of the clover contained 41 lbs. of nitrogen per acre, the tops 136 lbs. The roots of alfalfa furnished 73 lbs. of nitrogen per acre to a depth of 1 ft., the alfalfa residue 126 lbs. of nitrogen.

There was no marked difference in the nitrogen contents of the soils of the corn and the alfalfa fields as represented by the samples analyzed. "The relative nitrogen content at any level appears to be determined by the texture of the soil at that level rather than by the cultural history of the field."

A cooperative investigation on the losses of nitrogen, organic matter, and humus from some Nebraska soils, F. J. ALWAY and E. S. BISHOP (*Nebraska Sta. Rpt. 1911, pp. 66–70, fig. 1*).—The results of analyses of 15 samples of adjacent virgin and cultivated soils from different counties in the State here reported indicate a decline in the nitrogen, organic matter, and humus contents under cultivation.

Influence of certain soil constituents upon nitrification, J. W. PATERSON and P. R. SCOTT (*Jour. Dept. Agr. Victoria, 10 (1912), No. 7, pp. 393–400, figs. 2; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 24, pp. 759, 760*).—The influence of caustic lime, calcium carbonate, gypsum, ferric hydrate, common salt,

citric acid, starch, sugar, and superphosphate on nitrification in soils was studied in a series of laboratory experiments on small samples of soil in bottles.

Caustic lime practically stopped all nitrification. Calcium carbonate was the most efficient of the substances tested in promoting it, superphosphate appreciably increased it, magnesium carbonate was very effective, gypsum had a moderate effect, and ferric hydrate had a distinctly favorable effect. Common salt and citric acid seriously hindered the process, and starch and sugar not only did not help nitrification, but aided in the destruction of the nitrates already present by denitrification. Sour soils were found to be very unfavorable to nitrification and plowing in of green or fresh stable manure may cause a temporary shortage of nitrates, particularly in damp soils.

"The nitrifying organisms are weakened by continued drought, and where the surface soil becomes unduly parched in a dry spell, nitrification will begin slowly after rain comes. . . . Red and brown soils, other things being equal, favor nitrification, as they contain a slow-acting base in the form of iron rust."

Guanin from a heated soil, E. C. LATHROP (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1260–1263*).—The author describes the method used in the separation and identification of the compound guanin, which was isolated in the course of investigations by the Bureau of Soils of this Department on the composition of the organic matter of the soil.

The moisture content of field soils under different treatments, P. B. BARKER (*Nebraska Sta. Rpt. 1911, pp. 106–110*).—Determinations of the moisture content during June, July, and August, 1909, 1910, and 1911, in each of the upper 6 ft. of soil in corn, small grains, alfalfa, and summer-tilled fields are reported.

The results showed that the summer-tilled fields contained more water at all depths than those producing wheat, oats, or alfalfa.

"The moisture content is also comparatively uniform in the upper 6 ft. and throughout the growing season. . . .

"The small grain crops contain the least percentages of moisture in the upper 4 ft. in June, July, and August for the years under consideration.

"The alfalfa and brome grass fields contain a lower percentage of moisture in the fifth and sixth feet than any of the other fields represented in the tables. They contain a trifle more water in the upper 3 ft. than the small grain fields.

"The moisture content of the small grain fields increases with the depth in the upper 6 ft., while the moisture content of the alfalfa fields decreases with depth from the second foot. The moisture content of the corn field decreases from the second foot to the fifth, when it begins to increase." Transpiration was a very important factor in causing a reduction in the moisture content of soils.

"The loss of water due to direct evaporation from the surface of the soil is a very small factor after the water becomes thoroughly distributed in the soil."

Soil mulch, H. J. YOUNG (*Nebraska Sta. Rpt. 1911, pp. 124–128*).—Observations as to the effect of a loose soil mulch on the evaporation of soil water and the transpiration of plants showed that such a mulch "was not much more effective than an unmulched soil in retarding the evaporation of the moisture that is well established in the soil.

"That if a hard layer of soil dries out to the depth of 2 or 3 in., it will act in the capacity of a mulch.

"That much more of the . . . soil water is lost through transpiration from the leaf surface of plants than is lost by evaporation from the soil surface."

Evaporation from a free water surface at Lincoln, Nebraska, G. A. Loveland and S. W. Beals (*Nebraska Sta. Rpt. 1911, pp. 193–197, fig. 1*).—Observations with the U. S. Geological Survey evaporating pans during the summer months of 1895–1910 are recorded.

A study of the movement of water in a uniform soil under artificial conditions, F. J. Alway and V. L. Clark (*Nebraska Sta. Rpt. 1911, pp. 246–287*).—Studies were made with soil having a hygroscopic coefficient of 5.6 and a maximum water capacity of 55 per cent to determine "(1) the upward movement of water from moist soil into drier soil; (2) the downward movement from moist soil into drier soil; (3) the loss from saturated soil in contact with the natural subsoil in situ; (4) the upward movement in a column of soil protected from loss below and at the sides but fully exposed to evaporation at the surface; and (5) the downward movement of water applied to the surface of a column of air-dried soil.

"In the first and second experiments cylinders closed at the bottom and provided with tight-fitting covers were used. All were 2 ft. long and 4 in. in diameter, except 3, which were 6 ft. long and 6 in. in diameter. On starting the second experiment 3 small holes were made near the bottom of each to permit of the passage of air. These holes were not found to cause any loss of moisture by evaporation into the outside air. In the third experiment the cylinders were 3 ft. long, 6 in. in diameter, and open at the bottom, but provided with tight-fitting covers. In the fourth experiment they were 3 ft. long, 6 in. in diameter, closed at the bottom, and without covers. In the fifth experiment they were 18 in. long, 6 in. in diameter, closed at the bottom, and provided with covers. . . .

"When the water content was below 10 per cent, the capillary movement of moisture in any direction was slight; but when some of the soil with a moisture content of above 10 per cent was placed in contact with the same soil containing only the maximum hygroscopic moisture, there was a practically uniform movement of water from all parts of the former into the latter, except that immediately adjoining the drier soil the change was much the greatest. The higher the water content the greater was the movement of water.

"When soil with a moisture content of approximately 12 per cent was freely exposed to evaporation from the surface, no loss by capillary movement occurred to a depth of 30 in. until after the third week, but by the end of eleven weeks the loss from this depth amounted to 1 per cent."

Return of vegetation and the revival of agriculture in the area devastated by the Soufrière of St. Vincent in 1902–3, W. N. Sands (*West Indian Bul., 12 (1912), No. 1, pp. 22–33, pls. 6*).—The eruptions of Soufrière were accompanied by incandescent avalanches which "burnt off all the vegetation on the slopes of the mountain and the surrounding districts, and covered the land with a large deposit of ejecta. . . . The depth of the covering of ejecta varied a good deal in different places; for instance, in some of the valleys it was from 50 to 80 ft. thick; on fairly level land from 1 to 5 ft.; whereas on steep slopes it was only a few inches deep."

A recent examination showed "that, notwithstanding that the last eruption took place but a few years ago, the lower lands are all fairly well covered with vegetation in the form of low bush, as are also the slopes of the mountain up to about 2,000 ft." The ejecta are being rapidly converted into soil under the influence of favorable climatic conditions and the action of plant roots and decaying organic matter. On the windward side of the island the restoration of natural vegetation and cultivated crops has been much more rapid and complete than on the leeward side. "Here, by a system of deep tillage and by utilizing green dressings, large quantities of the bush of the pigeon pea, and

self-sown native plants, such as wild hops (*Flemingia strobilifera*) and cattle-tongue (*Pluchea odorata*), fair crops of sugar cane, arrowroot, and pigeon peas have been produced. The lands on which these crops have been grown had, when taken up, about 12 in. of ash covering them, but this ash had been partly converted into soil by the large growth of native plants of the previous three or four years. It still requires, however, very heavy applications of manure and organic matter to make it capable of producing average crops." On the windward side of the island the fairly level lands have been in large measure reclaimed and are under cultivation in sugar cane, cotton, arrowroot, pigeon peas, and other crops.

It has been found that the volcanic ash alone does not contain sufficient fertilizer constituents to support plant life, and that it was only by deep cultivation through to the old soil, which was thus mixed with the ash, that crops could be successfully grown. The addition of large amounts of organic matter is necessary in order to maintain the fertility of the soil. This is done by means of manure or leguminous plants, which can be made to grow luxuriantly on the volcanic ash soils. The increased fertility observed in many cases since the eruption is attributed to partial sterilization of the soil. "The old soil, as is previously noted, was covered with about 2 ft. of hot, sterile ash. The effect of this would be to bring about a partial sterilization of the soil, and interfere with the balance between the different forms of living matter in the upper layer of it, and lead to an increase in the available nitrogen compounds. These valuable plant foods would in their turn stimulate the vegetative growth of any plants whose roots could obtain access to it, and this is actually what happened.

"Another interesting feature was the abundance of nodules on the roots of leguminous plants when planted in a mixture of ash and old soil, and the luxuriant growth made. This would tend to show that the nitrogen-collecting bacteria causing the formation of these nodules were not destroyed in the old soil; or were reintroduced with the planting material that was used, and finding partially sterilized soil, and therefore an absence of enemies, were given the best chance of increasing in numbers. It has been largely due to this fact that planters have been able to obtain such excellent crops, particularly of the pigeon pea, and also to utilize to a considerable degree the heavy growth made by this plant as valuable green dressing material."

The weathering of minerals of a sand dune under the influence of forest vegetation, K. Vogel von Falckenstein and H. Schneiderhöhn (*Internat. Mitt. Bodenk., 2 (1912), No. 2–3, pp. 204–213*).—In continuation of previous reports on the subject (E. S. R., 27, p. 217), the authors state that it was found that the lime and potash of the sand were derived mainly from the abundant supply of feldspars. These also strongly influenced the physical property of the soil through the formation of clay. Microcline was much more resistant than orthoclase. Magnesia and iron were derived from hornblende and chloritic-decomposition products, and possibly also to some extent from iron ore. Apatite, although present in small quantity, was important as a source of phosphoric acid.

Plant food in relation to soil fertility, C. G. Hopkins (*Science, n. ser., 36 (1912), No. 932, pp. 616–622*).—This is the full text of an article presented at the Washington meeting of the American Association for the Advancement of Science, already noted from another source (E. S. R., 26, p. 621).

Bacteriological-chemical investigations on stable manure, especially on the influence of different preservatives on the bacterial flora and the fermentation processes, W. Scheffler and O. Lemmermann (*Landw. Jahrb., 42 (1912), No. 3, pp. 429–547, fig. 1; abs. in Zentbl. Agr. Chem., 41 (1912), No. 11,*

pp. 735–750; Ztschr. Angew. Chem., 25 (1912), No. 40, p. 2085).—From a detailed study of the organisms and processes involved in the decomposition of manure and the means of controlling decomposition by the use of preservatives, the authors conclude that the loss of nitrogen from manure is not due solely to a specific kind of bacteria, but that the bacterial flora of the manure in general is involved in the process. Preservatives, therefore, will not prevent such loss, because although one species of denitrifying bacteria may be destroyed another will come into action.

Fertilizers and fertilizing, M. HOFFMANN (*Jahresber. Landw., 26 (1911), pp. 65–105*).—Recent investigations on this subject are classified and reviewed.

Methods of fertilizer and variety tests, E. A. MITSCHERLICH (*Landw. Jahrb., 42 (1912), No. 3, pp. 415–421*).—The results of a series of 20 experiments are reported in brief and used as a basis for a discussion of the experimental error. The latter is lessened by reducing the size and increasing the number of plats (duplicate as well as control).

Results of five years' experiments with fertilizers, J. HANSEN, H. NEUBAUER, ET AL. (*Arb. Deut. Landw. Gesell., 1912, No. 228, pp. II+194*).—Experiments on an estate in the Rhine Valley with manure and artificial fertilizers, alone and combined, and with nitrogenous, phosphatic, and potash fertilizers, and comparing potassium silicate and 40 per cent potash salt are reported in detail. The crops experimented with included sugar beets, oats, rye, and wheat.

Nitrogen appeared to be the principal fertilizer need in these experiments. Soluble potash salts produced some benefit. The silicate was worthless. Lime did not increase the yield. The phosphoric acid of the soil was readily assimilable and there was little or no response to phosphatic fertilizers.

The decomposition of commercial fertilizers of animal origin by bacteria, A. KOSSOWICZ (*Monatsh. Landw., 5 (1912), No. 11, pp. 321–332*).—This is a summary of investigations on this subject.

Fertilizers in Japan (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1527–1529*).—Green manures, fish fertilizers, and oil cakes have been extensively used for years, but the use of commercial fertilizers is increasing and a fertilizer industry, principally the manufacture of superphosphate, ammonium sulphate, and calcium cyanamid, has been developed. The importation of nitrate of soda and ammonium sulphate is increasing.

Notes on mineral wastes, C. L. PARSONS (*U. S. Dept. Int., Bur. Mines Bul. 47, 1912, pp. 44*).—Of interest to agriculture are references in this article to the search for potash in the United States, wastes of rock phosphate in Florida, which are especially large, waste and recovery of nitrogen in the coal-consuming industries, and recovery from the air by electric processes.

The electrical production of nitric acid from constituents of the air, C. ROSSI (*Separate from Atti Assoc. Elettrotec. Ital., 16 (1912), No. 4, pp. 51, figs. 10*).—The principles and the operation of various processes proposed for this purpose are discussed.

Oxidation of atmospheric nitrogen and development of resulting industries in Norway, S. EYDE (*Abs. in Jour. Indus. and Engin. Chem., 4 (1912), No. 10, pp. 771–774; Chem. Engin., 16 (1912), No. 5, pp. 188–191; Sci. Amer. Sup., 74 (1912), No. 1925, p. 331; Metallurg. and Chem. Engin., 10 (1912), No. 9A, pp. 617–619*).—This article is based upon an address before the recent International Congress of Applied Chemistry, which describes especially the application of the Birkeland-Eyde method in the manufacture of basic calcium nitrate at Notodden, Norway.

Fixation of atmospheric nitrogen by the Pauling process, J. VANDERPOL (*Ann. Soc. Agr. Sci. et Indus. Lyon, 1911, pp. 2–26, figs. 10*).—This process and its installation and operation at La Roche de Rame, France, are described in some detail.

Fixation of nitrogen by alumina and carbon, S. A. TUCKER and H. L. READ (*Abs. in Chem. Trade Jour., 51 (1912), No. 1331, p. 538*).—The authors' experiments led to the conclusion that aluminum nitrid (AlN) can be obtained from alumina and carbon in the ratio of 1 part by weight of the former to 0.353 part of the latter, according to the equation $Al_2O_3+3C+N_2=2AlN+3CO$. The reaction is rapid and most complete at from 1,800 to 2,000° C.

Nitrogen and carbids, S. A. TUCKER and Y. T. YANG (*Abs. in Metallurg. and Chem. Engin., 10 (1912), No. 9A, p. 584*).—This is a brief note on an investigation showing that "strontium carbid absorbs nitrogen at atmospheric pressure when heated to a temperature of from 1,000 to 1,200° C. and the product so formed contains an appreciable proportion of cyanid."

Synthetic ammonia, H. A. BERNTHSEN (*Jour. Indus. and Engin. Chem., 4 (1912), No. 10, pp. 760–767; Chem. Engin., 16 (1912), No. 5, pp. 175–182; Umschau, 16 (1912), No. 48, pp. 1009–1013; Sci. Amer. Sup., 74 (1912), Nos. 1929, pp. 386, 387; 1930, pp. 410, 411; Ztschr. Angew. Chem., 26 (1913), No. 1, Wirtschaftlicher Teil, pp. 10 16; abs. in Metallurg. and Chem. Engin., 10 (1912), No. 9A, pp. 637–642*).—This is a lecture delivered before the recent International Congress of Applied Chemistry, reviewing progress in investigations bearing upon the commercial development of the synthetic process of preparing ammonia.

Sources of nitrogen for agriculture and the utilization of waste sulphite-cellulose liquors, P. NITSCHE (*Ztschr. Angew. Chem., 25 (1912), No. 40, pp. 2058–2061; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 20, p. 1000*).—In this brief discussion of the existing sources of nitrogenous fertilizers "stress is laid on the need of enriching the soil with a carbohydrate nutrient so as to afford a cheap source of energy for the nitrogen-fixing bacteria. Waste sulphite-cellulose liquors when neutralized with lime so as to leave them faintly alkaline are suggested as admirably suited for this purpose; they contain a variety of directly available carbohydrates as well as lignin substances. Such application of these liquors for agricultural purposes will solve the problem of their disposal in the rivers."

The method of producing bicalcic phosphate with the help of electrolytically produced acid and alkali, W. PALMAER (*Abs. in Metallurg. and Chem. Engin., 10 (1912), No. 9A, pp. 581–584*).—The process (see E. S. R., 23, p. 719) is briefly described.

Pot experiments with Palmaer phosphate, P. LIECHTI and F. KELLER (*Landw. Jahrb. Schweiz, 26 (1912), No. 7, pp. 492–496*).—In comparisons of Palmaer (dicalcium) phosphate (E. S. R., 23, p. 719), superphosphate, and Thomas slag, in pot experiments with oats the results of one season showed the Palmaer phosphate to be a highly efficient fertilizer. The Kellner method of determining availability of phosphoric acid gave results more closely agreeing with the crop results than the Petermann method.

Origin of the phosphates of the Jardines, J. I. DEL CORRAL (*Bol. Ofic. Sec. Agr. Cuba, 13 (1912), No. 4, pp. 351–357*).—The origin, the composition, and the possible utilization of the phosphates found on these islands off the coast of Cuba are briefly discussed. The presence of considerable amounts of nitrogenous organic matter in these phosphates shows that they are phosphatic guanos.

Potash, silica, and alumina from feldspar, E. HABT (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 2 (1912), Sect. II, pp.*

117, 118; Amer. Fert., 37 (1912), No. 8, p. 38; Jour. Indus. and Engin. Chem., 4 (1912), No. 11, pp. 827, 828).—This paper describes in brief a method of obtaining potassium sulphate, aluminum sulphate, and silica from feldspar. The method consists essentially of fusion of 12 per cent feldspar with potassium sulphate and carbon, extraction of the slag with dilute sulphuric acid, and crystallization of alum from the extract. Potassium sulphate is obtained from the latter by precipitation of the aluminum with potassium sulphid.

Lime in agriculture (*Jour. Dept. Agr. Victoria, 10 (1912), No. 10, pp. 585–641, figs. 16*).—This article contains chapters on [The Importance of Lime in Victoria], by S. S. Cameron; Limestone Deposits in Victoria, by W. C. Robertson; The Chemistry of Lime, by P. R. Scott; The Practice of Liming, by A. E. V. Richardson; The Relation of Lime to Soil Fertility, by J. W. Paterson and P. R. Scott; The Use of Lime in Victorian Vineyards, by F. de Castella; Lime for Tobacco Land, by T. A. J. Smith; The Use of Lime in Potato Culture, by G. Seymour; and Lime for Orchards, by P. J. Carmody. Pot experiments with wheat are reported which showed that the addition of lime increased the availability of phosphoric acid in insoluble phosphates such as wavellite and vivianite.

Use of lime on land, F. D. Gardner (*Penn State Farmer, 5 (1912), No. 8, pp. 257–262*).—Studies on soils of the long-time fertilizer plats at the Pennsylvania Station showed that the Veitch method indicated only about two-thirds of the actual amount of lime advisable to apply under field conditions.

The production of lime in 1911, E. F. Burchard (*U. S. Geol. Survey, Advance Chapter from Mineral Resources of the United States, Calendar Year 1911, p. 76*).—This report shows that the production of lime in the United States in 1911 was 3,392,915 short tons, valued at $13,689,054, as compared with 3,505,954 short tons, valued at $14,088,039, in 1910. "This represents a decrease in quantity of 113,039 tons and in value of $398,985. The average price a ton in 1911 was $4.03, as compared with $4.02 in 1910, an increase of 1 cent a ton. The total number of producers reporting in 1911 was 1,089, as compared with 1,126 in 1910, a decrease of 37. This decrease in the number of producers was due partly to the inactivity of small kilns operated by farmers for burning lime for local use as a soil stimulant and partly to the tendency of the industry toward concentration of plants into fewer and larger units. The heaviest decrease in the number of producers was in Pennsylvania, West Virginia, and Wisconsin. A few States, among them Texas and Washington, showed an increase in the number of producers. In 1911 44 States, including Hawaii and Porto Rico, reported the production of lime; in 1910 lime was produced in 43 States."

Catalytic fertilizers, M. Cercelet (*Rev. Vit., 38 (1912), No. 981, pp. 381–389*).—The nature of the action of such fertilizers is explained and investigations on the fertilizing action of manganese, boron, and other metals and sulphur are reviewed.

Some manurial earths of Mysore (boodi mannu), A. K. Yegnanarayana Aiyar (*Dept. Agr. Mysore, Chem. Ser. Bul. 1, 1909, pp. 8*).—Analyses of 9 samples of village soil used as fertilizer showed nitrogen from 0.035 to 0.23 per cent, phosphoric acid from 0.54 to 1.6 per cent, lime from 0.82 to 4 per cent, and potash from 0.31 to 1.19 per cent.

The manurial value of the natural mulch on coffee estates, R. D. Anstead (*Planters' Chron., 7 (1912), Nos. 15, pp. 238, 239; 16, pp. 253–255*).—Data are reported from which it is estimated that the total mulch accumulation from shade and coffee trees was 4.2 tons per acre, containing 108.7 lbs. of nitrogen. A dry sample of the mulch contained 1.18 per cent of nitrogen and 14.03 per

cent of ash. The ash contained 2.36 per cent lime, 0.39 per cent phosphoric acid, 1.24 per cent potash, 7.68 per cent silica, and 2.36 per cent oxids of iron, etc.

Coffee pulp and composts, R. D. ANSTEAD (*Planters' Chron., 7 (1912), No. 33, pp. 465–470*).—Analyses of fresh and fermented pulp and of pulp to which lime had been added are reported with a brief discussion of the fertilizing value of the materials. The fresh pulp contained 2.61 per cent nitrogen, 0.81 per cent phosphoric acid, 2.38 per cent potash, and 0.57 per cent lime. The pulp which had fermented in a pit for 7 months contained 3.15 per cent nitrogen, 0.59 per cent phosphoric acid, 1.19 per cent potash, and 1.78 per cent lime. The pulp which had been mixed with lime contained 1.68 per cent nitrogen, 0.84 per cent phosphoric acid, 1.82 per cent potash, and 14.46 per cent lime.

The general conclusion is that "coffee pulp is a valuable fertilizing material containing a high percentage of nitrogen and potash and comparable, when the composition of the dry matter in it is considered, with the best Indian cattle manure."

Utilization of city refuse, H. BOCHER (*Bul. Soc. Agr. France, 1912, May 15, Sup., pp. 686–688; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1531, 1532*).—This is a brief summary of a prize essay describing and discussing methods of refuse disposal employed in England, various continental European countries, and America. In many cases the refuse in fine-ground condition or the refuse ashes are used to advantage as fertilizers.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Buls. 1910, July 3–11; 1911, June, pp. 2–11*).—These bulletins contain analyses and valuations of samples of fertilizers representing mainly brands of potato manures offered for sale during the spring of 1910 and 1911.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1910, Nov., pp. 3–23*).—This bulletin contains analyses and valuations of fertilizers, exclusive of potato manures, collected during 1910.

Inspection of cotton-seed meal, season 1911 and 1912 (*Bul. [Miss. Dept. Agr. and Com.], 7 (1912), No. 12, pp. 1–9*).—The moisture and nitrogen contents and valuations of samples examined during the season of 1911–12 are reported.

AGRICULTURAL BOTANY.

On nutrition and reproduction in plants.—I, Bibliographical introduction. II, Mineral nutrition of the plant in relation to the formation of the vegetative and reproductive organs, L. MONTEMARTINI (*Advance print from Atti Ist. Bot. Univ. Pavia, 2. ser., 14 (1910), pp. 65–128, pls. 8*).—Of the six parts contemplated for this series, the author here presents two. After a short historical discussion, closing with a very extensive bibliography, he gives an account of his experiments made in 1908-9 with *Torenia fournieri*, *Solanum nigrum*, and plantlets of wheat and corn, from which he reached the following conclusions:

The meristematic differentiations which result in the formation of floral buds are not due to simple variations either in the quantity of water in the plant or in that of the minerals therein dissolved, but to special chemical processes which require determinate conditions. To these both the qualities of the mineral substances furnished to the plant and the chemical and physicochemical state of the protoplasm, as well as the stage of development, are of significance.

The chemical processes themselves which influence reproductive changes are not always precisely the same, but vary according to conditions both internal and external to the organism. Phosphorus generally plays an important part in such reproductive processes, while nitrogen usually favors vegetative develop-

ment chiefly. Under certain conditions phosphorus may strongly influence nutrition and growth in size. See also a previous note (E. S. R., 27, p. 130).

A physiological study of the germination of Helianthus annuus.—II, The oily reserve, E. C. MILLER (*Ann. Bot. [London], 26 (1912), No. 103, pp. 889–901*).—In continuation of previous work (E. S. R., 24, p. 628), the author reports on the changes undergone by the oils in germination of sunflower seeds. These were examined at five stages, about 3½, 5, 7, 10, and 14 days after the planting of the seed, the findings being in substance as follows:

The acid value of the ether extract of the seed is at first low, about 1.6, and remains about the same for the oily material of the cotyledons until about two-thirds of the oily reserve has disappeared from them, after which the acid value increases rapidly. Probably with the exception of the increase of free acid no change takes place in the oily reserve of the cotyledons until the last stage, when it amounts to 5.3 per cent of the original oily reserve. Apparently the changes taking place at this stage consist in the breaking down of the higher fatty acids and glycerids into those of lower molecular weight, a partial saturation of the free and combined fatty acids, and a marked increase in the amount of free acid. The amount of oily material in the hypocotyls and roots remains practically constant for all stages. While some of the constants of the oily material of the hypocotyls and roots during the first three stages are said to have a striking resemblance to those of the oily reserve of the cotyledons at those stages, the results in general are said to show that there has occurred a gradual but well defined breaking down of the oily material into free fatty acids and glycerids of lower molecular weight, a marked saturation of the fatty acids, and an increase in the amount of the hydroxyl group of the oily matter. During the last two stages these changes are very rapid and very marked.

The influence of the removal of the flowers on the formation of sugar in the stems of maize and saccharin sorghum, E. HECKEL (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 16, pp. 685–690*).—The results of experiments in removing the staminate and pistillate flowers of maize and the entire flower cluster of sorghum are given.

It is shown that the complete removal of all the flowers in maize and sorghum is followed by an increase in the saccharose content of the stalks. In the corn stalks the increase was greatest about the end of August, after which there was a gradual reduction in the percentage of saccharose as well as an increase in that of levulose and dextrose. With sorghum where all the flowers were removed by cutting off the top, a decided increase in saccharose was noticed, specimens analyzed on October 9 having 12.19 per cent saccharose as compared with 7.35 in the check lot. At the same time the proportion of levulose and dextrose in the detasseled plants was 1.06 as compared with 2.2 for the check.

Studies on sterile cultures of maize in regard to nitrogen assimilation, I. SHULOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 2, pp. 200–206*).—The author, experimenting with sterile cultures of maize, obtained results identical with and held to be confirmatory of those previously had from unsterilized cultures, namely, the assimilation of nitrogen from ammonium sulphate, the considerable increase in utilization of rock phosphate under the influence of ammonium nitrate, the noteworthy physiological acidity of ammonium sulphate, the depressing effect of this compound on the development of plants, and the lessening of this harmful influence by use of ammonium nitrate.

A new and somewhat unexpected result was to find that ammonium nitrate (in case of maize 1½ months old) does not show physiological acidity, although

upon this reliance had previously been placed in explaining the increased utilization of rock phosphate in the presence of the nitrate. It is held that the explanation must now rest on other grounds.

The influence of zinc on the utilization by Aspergillus niger of nutrient sugar, nitrogen, and mineral, M. JAVILLIER (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 2, pp. 190–193*).—The results of experiments as reported show that the presence of zinc increases in marked degree both the employment of the materials needed for growth by *A. niger* and the economy of such utilization, that is, the amount of dry substance formed per gram of nutrient substances used, as sugar, nitrogenous bodies, or ash (phosphorus, potassium, etc.). See also a previous note (E. S. R., 26, p. 431).

The influence of temperature on the absorption of water by seeds of Hordeum vulgare in relation to the temperature coefficient of chemical change, A. J. BROWN and F. P. WORLEY (*Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 582, pp. 546–553, dgms. 4*).—Following the investigations of one of the authors regarding the occurrence of a differential septum in the seeds of barley (E. S. R., 21, p. 126), variations were noted in the rate at which water enters with alterations of the conditions of the experiment.

In the present paper an account is given of the influence of temperature on the rate at which water is absorbed by barley seeds. It was found that during the earlier stages of the experiment the rate at which the entry of water took place increased rapidly as the temperature rose. Subsequently, when the saturation point is approached and equilibrium is established between the seed and the water, the curves tend to run together.

As a result of the investigation it was found that the temperature coefficient is high and of the order of that of a number of chemical actions occurring in solution. Moreover, the velocity with which water is absorbed by the seeds is almost exactly an exponential function of the temperature.

In another series of experiments, aqueous solutions of ethyl acetate were used, which showed remarkable power in accelerating the velocity with which water enters the seed. This is believed to be due in large measure to the simplifying action of the solute on the molecular structure of water.

The effect of external conditions upon the after-ripening of the seeds of Cratægus mollis, W. E. DAVIS and R. C. ROSE (*Bot. Gaz., 54 (1912), No. 1, pp. 49–62*).—The authors experimented with seeds of hawthorn under varied conditions, reaching results and conclusions which may be briefly stated as follows:

Seeds of hawthorn have normally a latent or after-ripening period of one or more years (the cause of this delay appearing to be in the hypocotyl), but this period may be shortened to about 3 months by removing the seeds from the carpels and keeping them moist at 5 or 6° C., the optimum temperature, or to 1 month by removing the testa and treating the seeds in the same way. Seeds at 0° C. after-ripen slowly, but not at all from —2 to —3°, nor are alterations of temperature favorable to this process. The influence of given oxygen pressures has not been determined. Pulp, carpel, and seed coat tend to delay the process, presumably by preventing free access of water. Seeds treated dry or under water did not after-ripen. The optimum temperature for germination is considerably above that for after-ripening, but the processes appear to be continuous. The nature of the process of after-ripening remains unknown.

The biology and coloration of flowers, M. MÖBIUS (*Ber. Deut. Bot. Gesell., 30 (1912), No. 7, pp. 365–375*).—Besides discussing the relation of insect visits to coloration of flowers, the author discusses the causation of the colors. Some of these he found to be due either to chlorophyll, anthoxanthin, anthocyanin, a brown-producing pigment which he has called anthophæin, or to the combination of two or more of these.

Coloration and markings of flowers as related to anthocyanin and tannin, E. PAASCHE (*Beiträge zur Kenntnis der Färbungen und Zeichnungen der Blüten und der Verteilung von Anthocyan und Gerbstoff in Ihnen. Inaug. Diss., Univ. Göttingen, 1910, pp. 114*).—As the result of investigations carried out in detail with flowers of numerous plants, the author arranges these in lists showing, respectively, (1) anthocyanin and tannin precipitate in the same cell layers; (2) anthocyanin and tannin not in the same cell layers; and (3) anthocyanin in life without corresponding tannin precipitate after treatment.

Tannin idioblasts were found to be most common in the neighborhood of the vascular bundles of several flowers, but were distributed hypodermally in one or two others. Anthocyanin was found in crystalline form in 15 flowers, usually in the region where a color transition appeared. A few monocotyledons studied showed no anthocyanin coloration.

Anthocyanin and tannin in vegetable organs, E. WISSEMANN (*Beiträge zur Kenntnis des Auftretens und der Topographischen Verteilung von Anthocyan und Gerbstoff in Vegetativen Organen. Inaug. Diss., Univ. Göttingen, 1911, pp. 111*).—Investigations made on the different parts of numerous plants enable the author to give a detailed account of the distribution of anthocyanin and of tannin in these plants, singly and by groups. Among the more general statements made are the following:

Anthocyanin undergoes changes as the organs grow older, showing an increase to a maximum and then a decline. No relation was found to exist between its presence and the size of the containing cell. Tannin in some cases also shows a change corresponding to the development periods of the plant, these in some instances corresponding to the alterations in anthocyanin content. Anatomical differentiations in or near a region which shows differences in tannin were quite common. Both anthocyanin and tannin show a preference for the nerves as compared with the parenchymal portions of the leaf in most cases.

The effects of light on growth, HELENE JACOBI (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), I, No. 7, pp. 1001–1031, figs. 2*).—The author gives details and curves showing growth in length resulting from varying the intensity and duration of illumination of etiolated bean, white mustard, and wheat seedlings.

Continued illumination for 2 hours with carbon incandescent lamps, followed by darkness, gave persistent retardation of growth if the light was of from 100 to 25 candlepower. If from 25 to 0.55 candlepower persistent acceleration resulted. Illumination with 100 candlepower for from 2 to 1 minutes gave a retardation, but for shorter periods an acceleration of growth.

In series of experiments where the product of intensity by time was a constant it was noted that, in case of bean seedlings of the same age, those longer exposed showed the greater retardation, while in case of those of different ages the younger were the more retarded by intensity of illumination, the older by the length of its duration. In some instances plants exposed to daylight for several days showed acceleration of growth from the second day on. Light is said to show analogies with some chemical stimuli inasmuch as in slight intensity or short duration it accelerates growth. Relative humidity and heat radiation apparently interfere to such a degree as to require investigation of the influence of these factors in this connection.

Experiments on the influence of electricity upon plant growth, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 354–367*).—In continuation of previous experiments carried on in connection with G. Erlwein (E. S. R., 25, p. 131), the author tested the effects of electric discharges of varying voltage on the growth and yield of several economic plants, with and without a supply of artificial nutriment. As regards the question whether in

such circumstances nitrogen compounds are formed and utilized by the plant, the results of these experiments are held to be inconclusive.

The effects of electric illumination on growing plants. GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg*, 4 (1911), No. 4, pp. 305–317).—Nightly illumination was continued from soon after seed time nearly to cropping of barley, potatoes, lettuce, tomatoes and various flowers, all under usual conditions of fertility, cultivation, and irrigation, and the resulting increase of yield was ascertained by analysis. This was either negative or very slight in nearly every case, though the author thinks that experiments with stronger lights might show better and more profitable results.

Radio-activity in relation to plant life. P. BECQUEREL (*Rev. Gén. Sci.* 23 (1912), No. 15, pp. 576–584).—As a result of numerous experiments on bacteria and fungi, and on seeds, flowers, and foliage of higher plants, it is stated that Becquerel rays in certain intensities are able not only to arrest growth and development but also to alter tissues, even to the extent of causing death. Detailed accounts are given of the different effects observed by the author, also some observations on the possible relation of radio-activity to the origin of life.

Forcing plants with radium. H. MOLISCH (*Umschau*, 16 (1912), No. 21, pp. 408–410, figs. 3).—Previously noted from another source (E. S. R., 27, p. 437).

The extent of the root system of Cucumis sativus. R. J. H. GIBSON (*Ann. Bot. [London]*, 26 (1912), No. 103, pp. 951, 952).—The author criticises the statements of W. S. Clark in regard to his measurements of the root systems of several plants, particularly *Cucurbita maxima*, contrasting therewith his own findings on the measurement of *Cucumis sativus*, which he declares showed a much smaller total extent.

A study of the leaf position of compass plants. A. MAYER (*Jahrb. Wiss. Bot. [Pringsheim]*, 50 (1912), No. 4, pp. 553–574, fig. 1; also in *Ztschr. Bot.*, 4 (1912), No. 9, pp. 657, 658).—The author's studies on the habits of *Lactuca scariola*, as affected by moisture and light, led him to conclude that the former is a conditioning factor in leaf behavior as well as in stem development; that the torsion which results in meridional position develops only on long and unequal exposure of the two sides of the leaf to illumination; and that this torsion is an effort, so to speak, to equalize this exposure, the sun in an east or west position being most influential in producing such torsion.

Further contribution to the study of the inheritance of hoariness in stocks. EDITH R. SAUNDERS (*Proc. Roy. Soc. [London]*, Ser. B, 85 (1912), No. B 580, pp. 545–554).—As a result of further studies on inheritance of characters in stocks, the author concludes that sap color is due to the presence of two factors, in the absence of either or both of which the sap is colorless. Hoariness also depends upon the presence of two factors between which and the sap-color pair a certain interrelation may exist. This interrelationship between the two pairs of factors is such that when certain strains are intercrossed the hoary effect due to the presence of this pair is only manifest when the color pair is also present. Glabrous plants, whether alike in color or not, when bred together, will yield an F_1 all hoary, or mixed hoary and glabrous, or all glabrous, according as the combined contribution of ovule and pollen grain includes the four factors enumerated above. When F_1 from unions between glabrous plants is all glabrous, all later generations derived from F_1 will also be glabrous. When F_1 from such matings is all hoary, F_2 will be mixed, the proportion of hoary and glabrous individuals depending upon whether the F_1 crossbred is heterozygous in some of its characters.

Gigantism in Primula sinensis. F. KEEBLE (*Jour. Genetics*, 2 (1912), No. 3, pp. 169–185, pl. 1, figs. 5).—The author records the origin of a giant form of

P. sinensis from a normal form the pedigree of which is known, describes the histological characteristics which distinguish this giant, and presents the results of experiments which have been made on the genetics of gigantism.

He claims that the giant form of White Queen Star originated from a normal strain of known pedigree in the course of selection experiments made with plants possessing flowers with supernumerary petals. A histological study indicates that the gigantism of the mutant is due to that of its cells. The giant form arose suddenly and breeds true. It is moderately fertile with its own pollen but absolutely sterile when crossed with other varieties, including the parent form. Gigantism in this plant is due to three factors and the character is dominant to normal character. Numerous semigiant races exist and these intergrade with one another, hence their existence is not generally recognized. Giant forms which breed true may be produced by crossing nongiant races of *P. sinensis*. Fluctuating variations may owe their origin to the heterozygous state of one or more factors in a form from the genetic constitution of which is lacking entirely one of the factors for the production of a Mendelian character.

Species hybrids of Digitalis, W. N. Jones (*Jour. Genetics, 2 (1912), No. 2, pp. 71–88, pls. 3, figs. 45*).—The results are given of experiments in crossing two species, *D. purpurea* and *D. grandiflora*, in which reciprocal crosses were obtained which differed from one another and from the parents. From an analysis of the contrasted characters it is concluded that in general the expression of any character in the hybrids is intermediate between its expression in the two parents, the reciprocals differing from one another in that each shows greater resemblance to its seed parent.

FIELD CROPS.

Variation in yield and methods of arranging plats to secure comparative results, E. G. Montgomery (*Nebraska Sta. Rpt. 1911, pp. 164–186, figs. 4*).—The variation of results was studied in its relation to size and grouping of plats. The data presented were secured from a plat of land 77 by 88 ft. divided by imaginary lines into 224 permanent plats 5.5 ft. square. The land was sown continuously to Turkey Red winter wheat for 3 years. In 1911 the average yield per block was 550.9 gm., but the extreme range was from 346 to 802 gm.

To note the effect on the variation of yield the plats were grouped into plats consisting of 4, 8, and 16 of the small blocks 5.5 ft. square. For purposes of comparison the blocks were grouped in sets of 14, giving 4 sets of the smallest size, 2 sets of the second size, and 1 set of the largest. The original small blocks had a coefficient of variability amounting to 17.5 per cent which was reduced to 9.88 per cent when the plats were made 4 times as large. Further increase in size did not reduce the variation. These results indicated that for the particular piece of land there would be no object in having plats larger than this minimum size which was 11 ft. square.

When these same blocks were combined into larger units by systematic repetition, there was a very marked reduction in variability. In sets of 16, in which every fourteenth block of the 224 was taken as constituting the group, there was a coefficient of variability of 2.01 per cent as compared with 7.85 per cent for 16 adjacent blocks.

The effect of irrigation on the growth and composition of plants at different periods of development, J. A. Widtsoe and R. Stewart (*Utah Sta. Bul. 119, pp. 169–200*).—Experiments were conducted in cooperation with this Office to determine under varying amounts of irrigation and at different periods of

plant growth the total yield of dry matter and the proportion and chemical composition of the plant parts. The work was conducted on the Greenville farm on a calcareous loam soil very deep and very uniform in texture and chemical composition. Wheat was grown in 1902 and 1903 and oats in 1904, and both crops were cut very near the ground and separated into leaves, stalks, and heads. Peas grown in 1902 and 1903 were cut near the ground and separated into leaves, stalks, and pods. Sugar beets were grown in 1903 and 1905 and the whole plant was harvested and separated into leaves and roots, while potatoes grown in 1904 and 1905 were harvested and separated into leaves, stalks, and tubers. Three plats were set aside for each crop, and all were irrigated on the same day, but one received at each irrigation a small quantity of water, another a larger amount, and a third a heavy application.

The results showed that at all periods the more water given a plant the less dry matter was produced per unit quantity of water. During the early period of growth the plants needed less water than during later periods. Leafy plants and a vigorous growth of the underground parts were produced by much water, while relatively large heads or pods were secured when little water was employed. Variations in the proportion of plant parts under varying irrigations became more definite as maturity approached, and as the quantity of irrigation water decreased the percentage of water in the leaves, stalks, heads, and pods also decreased.

The percentage of moisture in sugar-beet roots and potato tubers seemed to be little if any affected by the application of different amounts of water. With an increase in irrigation the percentage of ash increased in the parts above ground and decreased in the parts under ground. The percentage of protein in all plant parts increased as irrigation decreased. All variations in the chemical composition of plant parts, due to varying irrigations, were evident from the earliest period of irrigation, and became more marked as maturity approached. No correlation between the percentage of ether extract and the quantity of irrigation water was observed. There seemed to be a slight tendency for crops grown with much water to become woody, but the variation was not marked.

Reclamation of sand areas, A. MACPHERSON (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 4, pp. 364–370, figs. 6*).—This article discusses the value and use of several leguminous plants, including alfalfa, as soil binders in the reclamation of sandy lands in New Zealand and presents a report on the experimental plantings of alfalfa for this purpose. The results indicated that alfalfa could be grown on the soils in question without the application of inoculated soil or of lime.

[Tests with field crops at the McNeill substation, 1907–1911], E. B. FERRIS (*Mississippi Sta. Bul. 158, pp. 11, 12–29*).—Experiments with potatoes did not show very profitable returns, and fertilizer tests gave inconclusive results. Covering the seed with sugar-cane bagasse and then covering all with soil retarded sprouting and reduced the yield.

The results of fertilizer tests with cotton are reported in tables without comment. Varieties of cotton were tested from year to year, but the yields which are noted were comparatively low throughout. In 1907 Cleveland Big Boll ranked first with a yield of 370 lbs. of seed cotton, in 1910 Simpkins with a yield of 380 lbs., and in 1911 Ashcraft Double-jointed Snowbank with 625 lbs. An experiment on the time of planting cotton in its relation to weevil control resulted in the following yields of seed cotton per acre for the different dates of planting: April 1, 278 lbs., April 15, 289 lbs., May 1, 55 lbs., May 15, 0 lbs.

The results of fertilizer tests with corn are described, but no conclusions are drawn. In 1910, 12 varieties under test ranged from 29.1 to 42.9 bu. per acre, Boone County White leading in yield. In 1901 Florida Flint, among 6 varie-

ties, led in yield with 37.5 bu. per acre. A fertilizer test in 1911 gave but slight differences in yield of silage for the different applications compared.

The work with oats demonstrated its value for winter and spring pasture and for hay. In 1907 and 1908 more than 3 tons of hay per acre were secured, but grain was not matured in any of the tests. The yields of hay, of varieties of oats and wheat, and the results of fertilizer tests with oats are reported.

Trials with alfalfa showed the crop to be unsuited to southern Mississippi conditions. Crimson clover was not a complete success, but fairly good results were secured when 80 lbs. of nitrate of soda per acre was given as a top-dressing. Bur clover and red clover did not prove profitable, while vetch made a good growth but largely failed to reseed itself.

Notes are also given on culture tests with sweet potatoes and sugar cane, and the yields for 1903 to 1911, inclusive, of seed cotton, pea vine and oat hay, and corn in a rotation test are presented in a table without conclusions.

The inheritance of the ligule and auricles of corn leaves, R. A. EMERSON (*Nebraska Sta. Rpt. 1911, pp. 81–88, figs. 4*).—Corn plants lacking the ligule and auricle were observed by the author in pedigreed cultures made in 1910. The particular family, the progeny of a self-pollinated plant of the preceding year, contained 17 plants all of which showed the peculiarity. Whether the parent plant exhibited the abnormality was not observed. The progenies of three related and comparable families showed one family with only normal leaves and two with both normal and liguleless plants, the combined number being 39 normal and 16 liguleless.

From these results it was concluded that absence of ligule and auricle is a recessive trait and that the original ear giving rise to these liguleless families was borne on a normal leaved plant that was hybrid with respect to ligule and auricle, and subsequent experiments were conducted to confirm this view of the matter. In these later experiments, 6 liguleless plants produced from self-pollination a total of 175 offspring, all liguleless. Four ligueless plants crossed with unrelated normal-leaved individuals produced 103 normal-leaved plants. Twelve of these first-generation hybrids yielded from self-pollination 572 normal-leaved and 176 liguleless plants, while 1 heterozygous normal-leaved plant crossed with an unrelated homozygous plant produced 4 normal-leaved individuals. Two of these 4 on being self-pollinated bred true, producing 96 individuals with normal leaves, while the other 2 yielded 61 normal-leaved and 29 liguleless progeny. In the families in which both types of leaf occurred, there were found 672 normal-leaved and 221 liguleless-leaved plants, giving a ratio of nearly 3:1.

Breeding experiments with this material were continued, but no definite correlation was observed between ligulelessness and any other character, except that of the nonauriculate condition. It is pointed out that the sharpness with which the nonauriculate condition segregates out in second generation hybrids and its inheritance independent of several common characters in corn render it of ready control in breeding work.

The inheritance of certain forms of chlorophyll reduction in corn leaves, R. A. EMERSON (*Nebraska Sta. Rpt. 1911, pp. 89–105, figs. 4*).—An account is given of breeding experiments with special reference to absence of chlorophyll in corn leaves in its relation to Mendel's law.

In 1909, a single corn plant marked with longitudinal stripes of green and white was self-pollinated and also crossed with a fully green plant. In 1910, the selfed seed gave a poor stand and the crossed seed a fairly good one but no variegated plants appeared in either lot. Seeds from these plants again produced no striped plants but gave rise to several pure white ones which

suggested, among other things, that the original plant was heterozygous for green and a further study was made with the available material.

A plant from a stock of corn in which white seedlings occurred, but itself fully green, was crossed with various pure green races. White seedlings appeared in several second-generation progenies, all tracing back to the same grandparent. White seedlings were recorded in 41 distinct progenies tracing back to 5 apparently unrelated stocks and containing 1,903 plants, of which 1,457 were green, 9 being prominently variegated, and 446 were white. Of 43 plants from families in which white seedlings occurred, 15 were found to breed true to the green color and 28 produced both green and white seedlings. Of 17 plants from all-green families, resulting from a cross of pure-green plants with hybrid-green ones, 9 produced green only and 8 yielded both green and white plants. The results of several other experiments along these same lines are described.

The investigation pointed out that the reduction of chlorophyll manifests itself in different ways and degrees. The entire absence of chlorophyll, and apparently even of plastids, behaved in inheritance as a simple Mendelian recessive. Yellowish-white seedlings, indicating an almost complete absence of chlorophyll and a marked reduction in plastids, were also a manifestation of simple Mendelian recessiveness. It was found that when a partial reduction of chlorophyll in the growing and mature plant is indicated by a yellowish-green color not noticeable in the seedlings, the plants rarely mature good ears but produce pollen abundantly.

The entire or partial absence of chlorophyll from a few very narrow streaks in some leaves, although occurring in a family that produced pure whites, was considered as probably not due to heterozygosis of green and as being apparently a recessive character. The partial or complete absence of chlorophyll from more or less broad and elongated areas of the leaf also appeared to be a Mendelian recessive. A definite narrow striping of the leaf, not a form of variegation but due to the dark green color in the region of the fibrovascular bundles and narrow stripes of very pale green between them, is also believed to be a recessive character. The appearance of yellowish spots coalescing into rows between the veins of the leaf appeared in two successive generations in the same stock of corn, suggesting that it may be an inherited character. It is stated that almost nothing is known of the possible interrelations of these different forms of chlorophyll reduction and that in so far as their inheritance has been studied they have appeared as Mendelian recessives.

Preliminary report on effect of close and broad breeding on productiveness in maize, E. G. MONTGOMERY (*Nebraska Sta. Rpt. 1911, pp. 181–192, figs. 8*).—The experiment described was conducted for 3 years to determine the degree of relationship where close fertilization ceases to be injurious and where crossing becomes beneficial.

For the purposes of this work, the progeny of 4 of the best yielding rows in a series of ear-to-row breeding plats was used as a basis. Five ears were selected and part of each ear was planted in an isolation plat. In a second plat a part of each ear was planted for close-breeding experiments and in a third plat a cross-fertilization experiment was started, using ears from other high-yielding strains of the same variety. The degrees of relationship studied were self-fertilization; close fertilization, each ear being fertilized by a mixture of pollen from 10 to 15 sister plants and the stock continued each year from a single ear; close fertilization, in which each ear was fertilized by a composite sample of pollen from 15 sister plants, all from the same original ear and the stock continued from a composite sample of 15 ears; cross fertilization; ear-to-row breeding; and customary seed selection in the field.

The results showed that inbred corn was much reduced in size and yield but that considerable variation existed in the degree of reduction between inbred strains. Two inbred strains were practically sterile in 1910 and two more in 1911. With one exception, all plants from an inbred strain were alike but the pure types secured differed among themselves in such characters as tillering capacity, color, size, and shape.

The results from close breeding indicated loss of vigor and yielding capacity, but the rate of decline appeared slower and different strains were differently affected in the test in which a composite sample of pollen from 15 sister plants was used to fertilize each ear and the stock was continued each year from a composite sample of 15 ears than in the other close-breeding experiment. With the cross-bred strains in the experiments intercrossing became so general that in 1911 the original strains had lost their identity and gave only a slightly better yield than the original check.

In the case of the ear-to-row selections, which were quite narrow under the conditions of the experiment, the yielding power was maintained. Improved corn grown and selected under field conditions for 5 consecutive years and compared each year with a check maintained a difference in yield in its favor, although this difference was reduced in 1911 as compared with former years.

It is believed that the most important result indicated so far by the investigation, which is to be carried further, is that all degrees of close relationship are injurious and the yield is improved as relationship is widened. It is suggested that these results may vary considerably with different varieties and that they should be verified under a variety of conditions.

Tests of corn planters with graded corn, L. W. and C. F. Chase (*Nebraska Sta. Rpt. 1911, pp. 111–123, fig. 1*).—The results are recorded of experiments with ungraded and differently graded corn used in 3 different makes of planters with 4 different kinds of drop. The methods of grading the corn and installing and operating the planters for the purpose of the experiment are described in detail. The data secured are given in tables and discussed.

The planter with an accumulative-continuous plate movement edge-selection drop did not make a single hill out of 8,000 without at least one or more kernels, and in only one instance with 6 kernels. In every instance except one the edge-selection plates or planters gave a more nearly perfect drop than was secured with the round-hole plates. The most perfect drop was obtained with corn graded and then regraded by a machine grader and used in the edge-selection-intermittent drop of planter. Edge-selection planter plates in a comparative test gave 65.2 per cent perfect drop as compared with 52.8 per cent with round-hole planter plates.

A more accurate drop was obtained with the twice-machine-graded corn than with single grading and removal of butt and tip kernels. Separating the corn into different lengths of kernels gave only a slightly better drop at a sacrifice of a large proportion of corn suitable for seed. The results further showed no apparent relation between the accuracy of drop and the total number of kernels per acre.

The weed factor in the cultivation of corn, J. S. Cates and H. R. Cox (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 257, pp. 35, figs. 10*).—This bulletin reports the results of experiments conducted for the purpose of determining the relation of weeds to the tillage requirements of corn. The experiments numbered 125 and were conducted in 28 States. Twelve of these experiments pursued at 5 experiment stations formed part of a series of observations on the depth of cultivation, which included nontilled plats either hoed or scraped, and in one instance, in experiments at the Utah Station, plats scarified with the scuffle hoe for the removal of the weeds. In the work begun by this Depart-

ment in 1906, the cooperators were advised to select a piece of land of very even productivity, prepare the same by thorough breaking and harrowing, and to drill the seed corn on the level or unridged surface. From 1906 to 1910, the plats consisted in general of 5 rows each making, with the 1 intermediate row discarded at harvest, 11 rows in the experiment. In 1911, most of the experiments were conducted on 4 adjacent plats of 5 rows each, one row between every two plats being discarded at harvest. The average length of the plat was about 250 ft. After planting, the weeds and grass from 1 plat or series of plats were removed at frequent intervals by means of a sharp hoe without stirring the soil any more than absolutely necessary to accomplish the purpose. The other plat or series of plats received the ordinary cultivation in addition to having the weeds and grass removed by chopping to eliminate the weed factor.

The results of the Utah experiments, which have been previously noted (E. S. R., 12, p. 631), are considered separately as they were made under irrigation conditions. The authors state that the scarified plats received practically the same treatment given the nontilled plats in the cooperative experiments, and they further point out that the average yield for the 7 years on the scarified plats was 58.87 bu. of grain and 3,036 lbs. of fodder as compared with 52.91 bu. of grain and 3,487 lbs. of fodder for the shallow-tilled plats and 57.31 bu. of grain and 3,431 lbs. of fodder for the medium-tilled plats.

A résumé of all the experiments is presented in a table showing data on grain yields for 124 and on fodder yields for 55 of the total number of experiments. The general average for the entire series showed that the fodder on the uncultivated plats was 95.1 per cent of the cultivated and that the uncultivated grain was 99.108 per cent of the cultivated.

Of 68 experimenters giving data with regard to the maturity of the cultivated and uncultivated corn, 39 reported no difference in the date of ripening, 10 stated that the cultivated plats ripened first, and 19 that the uncultivated plats were first to mature. The average grain yield from the uncultivated plats expressed as a percentage of the yield from the cultivated plats was approximately 100 per cent for the first 2 groups and 95.58 per cent for the third group. These results are taken as indicating that when for any reason the uncultivated plat falls below the cultivated plat in yield the uncultivated corn has a tendency to mature earlier than the cultivated corn.

The study of the relation of the results to rainfall was based on the rainfall data available for 95 experiments. The lowest rainfall in the whole series with reference to mean was 42 per cent and the highest 133 per cent. Working out the relation between the yield of the uncultivated plats expressed in percentage of the yield of the cultivated plats and the rainfall expressed in terms of the percentage of the mean rainfall gave a correlation of only 0.142 ± 0.065, and the substitution of the actual rainfall in the calculation gave a correlation of only 0.0188 ± 0.067.

For the purpose of studying the relation of the results to soil productivity the experiments were grouped into those in which the yield on the cultivated plats fell below 30 bu., those varying from 25 to 60 bu., and those above 50 bu. A comparison of the yields of the 3 groups showed little evidence of any relation between the 2 factors.

In a number of experiments conducted on stiff clay soil, it was observed that as the season progressed and the weed seeds in the surface inch or two of soil germinated and the seedlings were destroyed, the weed growth became gradually less, while on the cultivated plats the weeds continued to grow thriftily throughout the season. On other soils, especially those of a loose, deep, moist character, the weed growth on the 2 sets of plats was about the same

throughout the season. While no data are available tending to prove which of the 2 methods of treatment would be the less conducive to weediness of the soil through a period of years during which different crops were grown, the observations in general seemed to indicate that for the years in which the land is in cultivated crops the work of weed control may be considerably simplified by shallow rather than deep working of the soil. The authors further state that the reasons why uncultivated land kept free from weeds should yield as much corn (grain) per acre as that given the most improved modern cultivation are not clear, but that the results of these experiments point strongly to the conclusion that the principal object of cultivation is the destruction of weeds.

The export and manufacturing tobaccos of the United States, with brief reference to the cigar types, E. H. MATHEWSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 244, pp. 100, pls. 2, figs. 37*).—This bulletin points out the distinction between the export and manufacturing and the cigar types of tobacco, gives data relating to the imports and exports of the commodity, discusses the early history, together with the development of the tobacco industry since the Civil War, and describes the different types of tobacco, the districts in which they are grown, and the manner in which they are produced. The different types of tobacco enumerated and described are the dark-fired type, the Maryland or Baltimore types, flue-cured, White Burley, and Green River tobaccos, One-Sucker types, and Virginia Sun-Cured, Perique, and Brazilian tobaccos. Statistics of all types are presented in tables.

The eradication of quack grass by chemicals, J. W. INCE (*North Dakota Sta. Spec. Bul., 2 (1912), No. 6, pp. 104, 105*).—This article briefly reviews results secured by different experiment stations in experiments testing the efficiency of different chemicals in the destruction of weeds and reports the chemical composition of a proprietary preparation for the destruction of quack grass. The results of the analysis indicated the preparation to be of doubtful efficiency for the purpose.

HORTICULTURE.

Plant culture, G. W. OLIVER (*New York, 1912, 3. ed., rev., pp. 312, figs. 109*).—The present edition of this work (E. S. R., 21, p. 739) is revised and slightly enlarged.

List of seeds of hardy herbaceous plants and of trees and shrubs (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1913, App. 1, pp. 20*).—This comprises a select list of seeds of hardy herbaceous plants, trees, and shrubs, which, for the most part, have ripened at Kew during the year 1912.

Horticultural explorations in Mindanao and impressions of Bukidnon and Butuan, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 11, pp. 577–588, pls. 3*).—This comprises a brief survey of the horticultural flora in Mindanao, Philippine Islands.

[Horticultural investigations at the McNeill substation], E. B. FERRIS (*Mississippi Sta. Bul. 158, pp. 7–12*).—In continuation of previous work (E. S. R., 19, p. 435) a summarized account is given of fertilizer and marketing experiments with fruits and vegetables.

In the strawberry tests considerable damage was done by strawberry rust. Experience has also shown that the crop should either be grown on new land or on land where crab grass seeds have been destroyed, either by the growing of velvet beans or by allowing the land to lie out long enough to get rid of the grass. Owing to the severe outbreak of San José scale and the nematode root disease the peach and plum orchards have been entirely uprooted. Tests are now being made of a number of varieties of citranges furnished by the U. S.

Department of Agriculture, together with several varieties of lemons and Satsuma oranges. Other fruits now being tested include grapes, figs, pears, mulberries, chestnuts, and pecans. Some data are reported on yields of asparagus, cabbage, and snap beans secured in applications of different fertilizer combinations.

Report of committee on cooperative experiments with fertilizers on fruits and vegetables, R. HARCOURT (*Ann. Rpt. Ontario Agr. and Expt. Union, 33 (1911), pp. 42–46*).—This comprises a brief statement of fertilizer experiments with fruits and vegetables, now being conducted under the direction of the Ontario Agricultural and Experimental Union.

Fertilizer experiments with garden crops and planting experiments with cabbage, N. ESBJERG (*Ber. Ribe Amts Landbofor. Havebr. og Husmands., 1911, pp. 21–28, figs. 3*).—Results of experiments conducted at the horticultural station at Esbjerg, western Jutland, are given.

In the cabbage experiments, which extended over a period of 3 years, both red and white cabbage gave larger yields when sown in the field and later on thinned out than when sown in seed beds and later carefully transplanted. Seed sown early in the spring as a rule gave the largest yields.

Some effects of fertilizers on the growth and composition of asparagus roots, F. W. MORSE (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 191–206*).—In connection with a series of fertilizer experiments on asparagus being conducted under the direction of the Massachusetts Station (E. S. R., 26, p. 44), the author made a study of the specific effects of nitrate of soda, superphosphate, and potash salts on the composition of the crop, as probable factors in determining the relative efficiency of these fertilizers. The present paper contains data and discussions dealing with the effects of these fertilizers on the roots of the asparagus plant.

Summarizing the results briefly, these experiments show that the use of medium amounts of chemicals exerts more favorable results on size and composition of the asparagus roots than the use of excessive amounts. The absence of any one of the 3 fertilizers resulted in a depression of weight of root, which was accompanied by a depression in nitrogen in the absence of nitrate of soda, and by a depression in the potash and ash in the absence of muriate of potash. The summer top-dressing with nitrate of soda produced smaller roots than the spring top-dressing, but with notably higher percentages of nitrogen. The exhaustion of the roots by the cropping season was most manifest in the percentages of sugar, in the roots from the summer top-dressed plats.

Horticultural research.—I. The planting of trees, S. PICKERING (*Sci. Prog. Twentieth Cent., 7 (1912), No. 26, pp. 280–291, pls. 4, fig. 1*).—A popular summary of the author's investigations dealing with the planting of fruit trees (E. S. R., 20, p. 1034).

New Philippine fruits, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 11, pp. 593–597, pls. 6*).—A number of fruits observed in the horticultural survey of Mindanao noted on page 235 are here described.

Notes and investigations on the influence of grafting, P. VIALA and P. PACOTTET (*Rev. Vit., 36 (1911), No. 940, pp. 685–699; 37 (1912), Nos. 942, pp. 5–7; 943, pp. 33–37; 944, pp. 65–70; 946, pp. 141–144; 38 (1912), Nos. 976, pp. 233–237; 978, pp. 293–298; 980, pp. 349–352; 982, pp. 405–411; 985, pp. 511–517*).—This is a report of the authors' investigations relative to the influence of American and European grape stocks on the products of selected scions. Numerous comparative observations made in various sections are also reviewed.

The authors conclude from the investigation as a whole, which has continued for over 15 years, that no deteriorations have occurred which may be attributed to the process of grafting. The characteristics and qualities of the wines and

of common wines are maintained or improved by grafting French vines on European or on American stocks.

Experiments in the preservation of natural colors in fruits, T. ZSCHOKKE (*Landw. Jahrb. Schweiz., 26 (1912), No. 6, pp. 429–431*).—A summary is given of the results secured with different preparations in some preliminary experiments undertaken to preserve the natural color of various orchard fruits.

The pollination and setting of fruit blossoms and their insect visitors, C. H. HOOPER (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 2, pp. 238–248*).—A paper on this subject, including a summary of the author's pollination experiments (E. S. R., 25, p. 838) continued at Wye, Kent, during 1911 and 1912.

Observations made of insect visitors to fruit blossoms led the author to conclude that the relative value in pollination of fruits by different insects is, roughly, 80 per cent due to hive bees, 15 per cent due to the various bumblebees, and 5 per cent due to miscellaneous insects. Suggestions are given for conducting experiments on pollination of fruits.

The pollination of fruit trees, W. O. BACKHOUSE (*Gard. Chron., 3. ser., 52 (1912), No. 1352, p. 381*).—In confirmation of his previous experiments with European plums (E. S. R., 26, p. 239), the author finds that many of these varieties are self-fertile and many others are self-sterile. An experiment was undertaken to discover to what extent the wind may pollinate a self-sterile plum. In accordance with the results secured by Lewis and Vincent in the pollination of apples (E. S. R., 21, p. 636) the author concludes that insects are necessary for efficient pollination whether a tree be self-sterile or not.

Varieties of apples, J. L. DUMAS (*Rpt. Wash. State Hort. Assoc., 8 (1912), pp. 18–31, pl. 1*).—This comprises suggestions to the revision committee of the American Pomological Society relative to the description and classification of apples recommended for commercial orchards in the United States and Canada. A chart comprising tentative descriptions of 49 varieties is here presented and discussed.

The flowers of apples as an aid in identifying varieties, E. A. BUNYARD (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 2, pp. 234–237, pls. 4*).—The author calls attention to certain characteristics in the floral organs of different varieties of apples and suggests the utilization of these characteristics as an aid to the identification of varieties.

Packing apples and peaches, W. H. ALDERMAN (*West Virginia Sta. Bul. 139, pp. 275–299, figs. 16*).—A popular treatise in which attention is given to both the barrel and box pack for apples and to the use of the Delaware basket as well as the 6-basket Georgia carrier for peaches.

A study of the quality and yield of a number of red varieties of grapes, H. FAES and F. PORCHET (*Terre Vaud., 4 (1912), No. 50, pp. 479–483*).—In continuation of previous investigations by the authors (E. S. R., 20, p. 241) tabular data secured in a test of several varieties of grapes are here reported for the period 1908 to 1912, inclusive. The data show the average fruit production and sugar content as well as the percentage of sugar and acid in the must of each variety.

The American grape nursery and experimental vineyard in the Province of Messina, A. RUGGERI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 10 (1911), No. 11, pp. 8–47*).—This comprises a report of the operations of the nursery and vineyard established near Messina in 1906 to test the adaptability of various American grapes and their hybrids as stocks for native varieties. The data relative to the behavior of various scions grafted on these stocks are presented in tabular form.

Suggestions on coffee planting for Porto Rico, T. B. MCCLELLAND (*Porto Rico Sta. Circ. 15, pp. 26, pls. 4*).—This circular, which supersedes Porto Rico

Station Circular 5 (E. S. R., 16, p. 372) embodies some later results from the station's investigations with coffee. It discusses the selection of site and soils, seed selection, preparation and planting, nursery operations, clearing land, road making, draining, planting distances, transplanting operations, care of coffee after setting, shade, and summary of expense per acre for the first 3 years of the young plantation. The experience at the station has shown the net cost per acre to the end of the third year to be $83.70.

Recent observations on an exception to the dicœcious character of the papaya, A. BERTEAU (*Agr. Prat. Pays Chauds, 12 (1912), No. 115, pp. 316–321, figs. 3*).—The author calls attention to the existence of certain papaya plants which in their exterior characteristics resemble male plants but which produce perfect hermaphrodite flowers capable of reproducing the type.

Pests of field, garden, and truck crops, H. A. SURFACE (*Bi-Mo. Zool. Bul. Penn. Dept. Agr., 2 (1912), No. 4–5, pp. 155–213, pls. 5*).—Popular descriptions are given of the more important insect pests and plant diseases of field, garden, and truck crops, together with methods for their control.

Colorado's horticultural inspection law, and methods for the control of insect pests and plant diseases, C. P. GILLETTE (*Off. State Ent. Colo. Circ. 1, 1910, pp. 15, figs. 12*).—Part 1 of this circular contains the text of the horticultural inspection law of Colorado. Part 2 describes a few important insect pests and diseases of fruits, and gives methods for their control.

Spray and practice outline for fruit growers, 1912, H. J. EUSTACE and R. H. PETTIT (*Michigan Sta. Spec. Bul. 57, pp. 17, figs. 3*).—This bulletin discusses the general spray treatment for orchard and small fruits and potatoes, preparation of spray mixtures, and poisons used in spraying.

Hazelnuts, E. GROSS (*Österr. Gart. Ztg., 7 (1912), No. 12, pp. 437–439*).—In continuation of the previous report (E. S. R., 26, p. 337) tabular data are given showing the yields of several different varieties of hazelnuts in 1912, as well as the total yield for each variety from the time it commenced to bear.

The most beautiful roses at the end of the twentieth century (*Les Plus Belles Roses au Début du XX^e Siècle. Paris, [1912], pp. X+235, pls. 28, figs. 57*).—The essential feature of this work is a catalogue of the best roses for cultivation in the temperate climate of France. The varieties are grouped in sections; a summarized description is given of each variety, together with the name of the introducer, date of introduction, synonymy, observations, etc. The catalogue is preceded by a historical sketch of the rose and a discussion of the characters, anatomy, and classification of roses. Other phases discussed include culture, propagation, pruning, fertilizers, artificial pollination, protection against insects and diseases, and utilization of roses. A number of varieties are shown in color.

The work as a whole was prepared under the direction of the rose section of the National Society of Horticulture of France.

Rogues in sweet peas, C. C. HURST (*Gard. Chron. 3. ser., 52 (1912), No. 1353, pp. 407, 408*).—An outline of a paper on this subject read at the Fourth Sweet Pea Conference, London, October, 1912.

As a result of his observations the author concludes that pure line breeding materially reduces the number of rogues. He recommends that all stock seed be selected from single plants grown not less than 3 ft. apart each way and that only plants from a true breeding (homozygous) stock be used. Each color should be grown at least 100 yds. from another and all type rogues eradicated.

FORESTRY.

The forests of northern Russia, I. Nevrli (*Izv. Imp. Liesn. Inst. (Mitt. K. Forstinst. St. Petersb.), 22 (1912), pp. 221–242; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2012–2015*).—A descriptive account of the forest formations in northern Russia.

The indigenous high forest situated in the divisions of George, Knysna, and Humansdorp, Cape Province, J. S. Henkel (*So. African Jour. Sci., 9 (1912), No. 4, pp. 68–76*).—This paper contains a short description of the forests and a statement of the system of management.

Forests, forestry, and forestal products, G. H. Knibbs (*Off. Yearbook Aust., 5 (1901–1911), pp. 452–468*).—A descriptive account and statistical review of Australian forests, forestry, and forestal products, including also statistics of the export trade.

Anatomical investigations of Argentine woods at the Royal Museum of Natural History in Vienna, A. Burgerstein (*Ann. K. K. Naturhist. Hofmus. [Vienna], 26 (1912), No. 1–2, pp. 1–36*).—A descriptive account of a large number of Argentine woods, including brief notes on the habitat and size of the trees, general characteristics, and internal structure.

Mechanical tests of Papuan timbers, J. Mann (*Proc. Roy. Soc. Victoria, n. ser., 24 (1911), No. 1, pp. 20–45, pls. 11*).—The results of bending, compression, tension, shearing, and burning tests of 6 species of Papuan timber are here reported in tabular form and discussed.

Yield and returns of blue gum (Eucalyptus) in California, T. D. Woodbury (*U. S. Dept. Agr., Forest Serv. Circ. 210, pp. 8*).—A popular circular based on a study of a number of blue gum plantations in California and aiming to show what may be expected from such plantations under favorable conditions.

Investigations made by the Forest Service indicate that returns from blue gum plantations are satisfactory if the total investment is $60 an acre or less. An investment approaching $160 per acre can not be expected to pay back more than the bare principal.

Contribution to the study of rubber in northern Madagascar, H. Hamet and L. Josse (*Agr. Prat. Pays Chauds, 12 (1912), Nos. 115, pp. 265–274; 116, pp. 372–379*).—This is a comparative study of the rubber yielding species of northern Madagascar, with special reference to yield and value of the latexes and methods of coagulation.

Notes on tapping experiments at Gunong Angsi, F. G. Spring (*Agr. Bul. Fed. Malay States, 1 (1912), No. 4, pp. 154–158*).—Some experimental tappings of cultivated Para rubber are reported. The trees were planted in 1905 at 8 elevations, ranging from 300 to 2,400 ft. A study of the growth behavior of these trees shows, generally speaking, that the higher the elevation the slower the growth. The yield of rubber likewise decreases in the higher elevations, the present experiments indicating that an elevation of 1,000 ft. or more is undoubtedly too high to secure a maximum yield.

Principles of drying lumber at atmospheric pressure: Part 1, the drying process and its basic principles; part 2, humidity diagram, H. D. Tiemann (*U. S. Dept. Agr., Forest Serv. Bul. 104, pp. 19, pl. 1, fig. 1*).—Part 1 of this bulletin discusses certain fundamental principles which have been deduced from experiments in drying lumber on a small scale conducted by the Forest Service for several years. Part 2 presents and discusses the use of a humidity diagram, which has been prepared to enable the dry kiln operator to determine quickly the humidity conditions and vapor pressures, as well as the changes which take place with changes of temperature.

The drying experiments thus far made by the Forest Service indicate that successful dry kiln operation requires the observance of the following points: The timber should be heated through before drying begins. The air should be humid at the beginning of the drying process and be made drier only gradually. The temperature of the lumber must be maintained uniformly throughout the entire pile with the aid of a large circulation of air. Control of the drying process at any given temperature must be secured by controlling the relative humidity, rather than by decreasing the circulation. High temperatures permit more rapid drying than lower ones, but certain species may not be able to stand as high temperatures as others. The degree of dryness obtained where strength is a prime requisite should not exceed that at which the wood is to be used.

Service tests of ties: Progress report, H. F. WEISS and C. P. WINSLOW (*U. S. Dept. Agr., Forest Serv. Circ. 209, pp. 25, figs. 2*).—This is a progress report on investigations undertaken by the Forest Service in cooperation with various railroads and tie-treating plants to obtain durability records of ties in active service. The first test was started in 1902 (E. S. R., 16, p. 783); thus far 8 test tracks have been constructed. The progress in some of this work has been noted (E. S. R., 19, p. 849; 20, p. 48; see also below).

The results thus far secured in these investigations show that all treatments, with one exception, have increased the durability of the ties over that of similar untreated ties. Just how much the natural life of the ties can be prolonged is not yet determined. Ties with low decay resistance, such as loblolly pine hemlock, tamarack, and beech, if laid untreated, should not be tie-plated, as they will decay before they will wear out. The increased resistance to decay secured from preservative treatment makes it highly desirable to protect treated ties from deterioration by mechanical cause. Although experience thus far is not conclusive as to the best form of plates to use, metal plates with flat or slightly corrugated bottoms have given the best results. Service tests on screw and cut spikes have thus far yielded no definite conclusions. When screw spikes are used, however, it is desirable to have some form of boss on the plates to reenforce the heads of spikes against lateral thrust.

Prolonging the life of crossties, H. F. WEISS (*U. S. Dept. Agr., Forest Serv. Bul. 118, pp. 51, pls. 6, figs. 15*).—This bulletin brings together the results of experiments of the Forest Service in prolonging the life of crossties. The data presented are taken from previous publications of the Forest Service, noted in the RECORD from time to time, as well as from many unpublished reports of field and laboratory tests. A bibliography of the literature consulted is appended.

The material is discussed under the following general headings: Preparing ties for preservative treatment, grouping ties to secure uniform treatment, preservative processes, treating-plant operation, protection of ties from mechanical wear, hewed *v.* sawed ties, economy through increased life of ties, and recommended practice in prolonging the life of ties.

DISEASES OF PLANTS.

Work of the station for plant physiology and pathology, V. DUCOMET (*Ann. École Nat. Agr. Rennes, 5 (1911), pp. 1–64, figs. 20*).—Contributions are made to the study of diseases of apple, including *Sphæropsis malorum*, *S. pseudo-diplodia*, and *Diplodia* sp., also observed on pears; of chestnut, including *Sphærella maculiformis*, *Diplodina castanea*, and a very important fungus, *Melanconis modonia* (E. S. R., 25, p. 149), which is mentioned in connection with that causing the chestnut bark disease in the United States; and of plums

and cherries, including *Fusicladium pruni*, *F. cerasi*, and *F. amygdali*. A discussion of some difficulties of experimentation is given, also a more detailed report on plum diseases and their treatment.

Report of the botanical research laboratory and the laboratory of phytopathology, L. LINSBAUER (*Programm u. Jahresber. K. K. Höh. Lehranst. Wein u. Obstbau Klosterneuburg, 1909–10, pp. 165–175, pl. 1, figs. 2*).—A brief report is made concerning some facilities and work of these now united laboratories, also observations made on certain plant diseases, among which may be mentioned "Droah," an Austrian grape disease; a rot of apple ascribed to a Glœsporium; a mildew affecting several of the juicy fruits, said to be due to *Penicillium italicum;* a bud rot disease of sour cherry, said to be caused by *Fusarium gemmiperda;* a Puccinia disease of lettuce; a Monilia attacking medlar and *Cydonia lusitanica;* the mildew attacking *Euonymus japonicus;* and a blossom disease of narcissus. Brief accounts are also given of some physiological and other investigations.

A report of the imperial mycologist for the year 1910–11, E. J. BUTLER (*Rpt. Agr. Research Inst. and Col. Pusa [India], 1910–11, pp. 50–57*).—This report includes investigations on a bud rot of coconut palms, said to be caused by *Pythium palmivorum;* a blister blight of tea, ascribed to *Læstadia theæ*, which is thought to be associated with the tea seed bug *Pœcilocoris latus;* a soft rot of ginger, thought to be due to *Pythium gracile;* a leaf spot of turmeric, said to be caused by a species of Taphrina, not described; a cotton wilt, ascribed to Rhizoctonia and probably another of undetermined cause; red rot and a root disease, apparently new, of sugar cane due to an undetermined fungus; a heart rot of pine, due to *Trametes pini;* a serious disease of *Mesua ferrea* of undetermined cause; a leaf disease of rubber, identified as *Cercospora cearæ;* a number of root rots noted in case of various crops, ascribed to Rhizoctonia; a disease of wheat hitherto undescribed; and several other plant diseases.

Plant diseases, 1911, L. LEWTON-BRAIN (*Fed. Malay States Rpt. Dir. Agr., 1911, pp. 8–10, 13*).—This report refers chiefly to fungus diseases, known or suspected, of rubber plants, including *Fomes semitostus, Hymenochæte noxia, Irpex flavus, Helicobasidium monipa, Sphærostilbe repens, Thyridaria tarda, Phyllosticta ramicola, Corticium salmonicolor, Limacinula javanica*, the thread blight fungus, a silvery white fungus on the bark (which has not been shown to produce any deeper injury), *Phyllosticta hevea*, and *Pestalozzia palmarum;* also to certain traumatic or physiological disorders. The spotting of prepared rubber has been found to be due to *Bacillus prodigiosus, Monascus heterosporus, Mycogone* sp., and *Spondylocladium* sp., the last three being saprophytic molds.

Palm diseases reported on are those ascribed to *Pestalozzia palmarum;* a so-called bud rot (not that known in India, however, it is said) of the coconut palm, in connection with which were found *Thielaviopsis* sp., *Thyridaria tarda*, also a few saprophytic molds; and a sooty mold ascribed to *Meliola palmarum*.

[Some Swedish Phycomycetes], B. PALM (*Svensk. Bot. Tidskr., 5 (1911), No. 3, pp. 351–358, figs. 3; abs. in Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 10–13, p. 311*).—The author describes two species said to be new, *Urophlyctis lathyri* and *Peronospora pedicularis*, the former being found on *Lathyrus montanus* and *L. pratensis*, the latter on *Pedicularis lapponica*.

Germination conditions of teleutospores of Uredineæ, I, II, P. DIETEL (*Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 1–4, pp. 95–106; 35 (1912), No. 11–13, pp. 272–285*).—This is an account of studies by the author on the germination of teleutospores of several heterœcious species of Uredineæ, the results obtained with each species being given.

Culture experiments with rust fungi, H. KLEBAHN (*Ztschr. Pflanzenkrank., 22 (1912), No. 6, pp. 321–350, fig. 1*).—The author carried out culture and infection experiments with about 20 species of rust fungi, the detailed results of which are given in connection with each.

Wintering of some rust fungi in the uredo stage was shown to occur either by germination in early spring by the uredospores formed in autumn or by early spread by the mycelium which had wintered in the infected spots. The hypothesis that grain rusts are carried over in the seed received no support from these experiments. Attempts to infect the plants with teleutospores failed in every instance.

Nematodes in or on plants, M. BRAUN (*Schr. Phys. Ökonom. Gesell. Königsb., 52 (1911), pp. 90–99*).—This is a brief discussion of the activities of nematodes found living in or on plants, giving a list of 28 species (representing 6 genera) with their hosts, also a bibliography of the subject.

Studies on chlorosis of plants caused by calcium carbonate, P. MAZÉ, RUOT, and LEMOIGNE (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 7, pp. 435–437; abs. in Chem. Zentbl., 1912, II, No. 17, p. 1490*).—Pursuant to previous work of one of their number (E. S. R., 26, p. 243), the authors state that the addition of 0.2 per cent of calcium carbonate to a solution in which *Vicia narbonnensis* was flourishing produced a chlorotic condition. Drops of a 0.02 per cent solution of ferric nitrate placed on the affected leaves was followed by the appearance of chlorophyll in 3 days, while ammonium sulphate had no effect on the chlorosis. The suggestion offered is that iron, insoluble by the nutritive medium here employed, is dissolved by acid excretions from the roots of some plants, as in case of maize, while other plants, as lupines, the Narbonne vetch, etc., are more apt to be deficient in acid and to become chlorotic. French grapes are said to be unaffected on lands having much lime, while American vines on the same lands suffer from chlorosis.

Experiments on the prevention of stinking smut on winter wheat, J. N. WALLDÉN (*Sveriges Utsädesför. Tidskr., 22 (1912), No. 4, pp. 242–252*).—The author investigated the effect of the copper sulphate and formaldehyde treatments on the germination of different varieties of winter wheat. The former solution used was of 0.5 per cent strength, the grain being immersed from 12 to 14 hours, while 0.1 per cent formaldehyde solution was used with 15 minutes' immersion. The germination of the wheat was determined after from 12 to 20 days.

There was a marked decrease in the germination of the wheat treated with copper sulphate solution, and a large proportion of the kernels showed weak or abnormal germination. This influence was especially noticeable in the case of seed of inferior quality. The wheat treated with formaldehyde solution showed practically normal germination after 12 days. The latter treatment is recommended for trial and adoption by Swedish farmers.

A contribution to the study of means for combating wheat rust, A. C. TONNELIER (*Trab. 4. Cong. Cient. Santiago de Chile, 16 (1908–9), pp. 136–142, pl. 1*).—Continuing earlier work with grain rusts (E. S. R., 26, p. 846), the author discusses the life history and relations of *Puccinia graminis* and reports experiments carried out for its control. It is stated that no more practical means of control was found than repeated applications of fungicides with copper as a basis. The production of resistant varieties by hybridization or otherwise is suggested as possibly a final solution to the problem.

Sclerotinia libertiana, a bean pest, S. D'AYALA (*Italia Agr., 49 (1912), No. 9, pp. 205, 206; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1679, 1680*).—The author states that *S.*

libertiana, which has been a cause of injury to beans for several years in a portion of Calabria, has been found to attack less severely late plants, also those manured with phosphates.

A new disease of potato, L. TRABUT (*Gouvt. Gén. Algérie, Dir. Agr., Serv. Bot. Bul. 49, 1911, pp. 11, figs. 3*).—The author gives a brief account of this disease, also of studies thereon by other writers since 1894. Of the various names applied thereto, as black scab, potato tumor, and wart disease, the last is preferred. The disease is ascribed to the action of *Synchytrium endobioticum*.

Wart disease of potatoes, H. C. LONG (*Gard. Chron., 3. ser., 52 (1912), No. 1349, pp. 326, 327, figs. 4*).—A description is given of the wart disease of potatoes due to *Chrysophlyctis* (*Synchytrium*) *endobiotica*, a disease which has been scheduled under the Destructive Insects and Pests Acts of Great Britain and which is absorbing the energies of a number of inspectors during the season. The attack of the fungus on the plant is described and attention called to its occurrence in practically all parts of the plant, even the leaves and flowers not escaping.

Judging seed potatoes, G. KÖCK and K. KORNAUTH (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 2, pp. 153–157*).—The authors apply their experience in the study of potato diseases (E. S. R., 25, p. 750; 27, p. 447) to the problem of valuing potatoes to be used for seed, giving detailed directions.

The presence of *Chrysophlyctis endobiotica* is deemed sufficient to condemn the stock and prohibit its being used for seed, as it infects the ground for a long time. Injuries to the skin of a considerable proportion, 70 per cent or over, of the tubers render the stock undesirable for planting purposes, as does also the infection of 25 per cent or over with any of several common potato diseases (Phytophthora, Rhizoctonia, Fusarium, Phellomyces, bacteria, etc.).

The gummosis experiments, 1911, J. A. HONING (*Meded. Deli-Proefstat. Medan, 6 (1911), No. 1, pp. 1–30*).—The author gives an account in detail of numerous experiments carried out at Medan on tobacco plants affected with gummosis ascribed to *Bacillus solanacearum* as influenced by chlorid of lime, permanganate of potash, and guano, used in varying quantities on different soils.

Some important fungus diseases of orchard trees, G. M. REED (*Ann. Rpt. Missouri Bd. Hort., 5 (1911), pp. 342–375, figs. 23*).—The author describes some of the more important fungus diseases of orchard trees in Missouri and calls attention to the influence of various external factors, as water supply, temperature, etc., upon the spread of fungus diseases. In connection with the treatment of diseases the use of Bordeaux mixture and lime-sulphur preparations is described.

Some investigations of the cedar rust fungus, Gymnosporangium juniperi-virginianæ, G. H. COONS (*Nebraska Sta. Rpt. 1911, pp. 215–245, figs. 5*).—Studies are reported on the cedar rust fungus, in which the author describes the ejection of spores similar to that given by Buller for some of the Hymenomycetes (E. S. R., 22, p. 542).

The author reports that the sporidia infect the apple by penetration of the cuticle, forming pycnidia and æcidia, and that the spores from the apple infect the cedar, in which the mycelium is perennial.

It was found possible to observe the ejection of the spores and to make spore prints from Gymnosporangium, as has been done from mushrooms and other fungi. Light did not seem to affect the spore discharge, nor dryness of the atmosphere so long as the spores were turgid. Temperatures from 7 to 30° C. had no effect. Anesthetics immediately stopped the discharge.

The discharge of the spores is believed to be brought about by the turgor relations of the spore and promycelium, and the pressure is considerable, as shown by the fact that the parts round off after their discharge.

This work emphasizes the connection between the Uredinales and the Hymenomycetes.

A bibliography is appended.

Brown rot on cherry trees, B. BARNA (*Köztelek [Budapest], 22 (1912), No. 38, pp. 1416, 1417; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1681, 1682*).—The author reports on experiments carried out in Hungary with some cherry trees attacked by *Monilia cinerea*. This is considered to be the conidial form of *Sclerotinia cinerea*, which is said to cause withering of the blossoms.

In 1909 after all fallen fruits and leaves, all mummified fruits, and all weeds had been removed and burned, the soil was turned over. During a warm period of the following winter the trees were sprayed with a 10 per cent solution of Dendrin, and this treatment was repeated in spring before the buds opened. About June 1 the ground was again turned. The half-grown fruits were again sprayed with 2 per cent solution of copper sulphate, and all diseased and prematurely fallen fruits were destroyed. During 1910 very favorable results were obtained. The treatment was kept up, and in 1911 the cherry blossoms are claimed to have been almost entirely free from this fungus.

Recent studies on infection of grapevines by Plasmopara viticola, H. MÜLLER-THURGAU (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 2–3, pp. 11–19*).—This is a summary of studies by the author on false mildew, the substance of which has already been noted from other sources (E. S. R., 28, p. 54).

Contamination of grapes by downy mildew, J. FOUDSAT (*Jour. Agr. Prat., n. ser., 24 (1912), No. 28, pp. 44–46*).—The author's tests showed no infection in any instance by the conidia of *Plasmopara viticola* placed on the upper surface of the leaf, while infection followed in most cases of inoculation on the lower side. To test the matter further, three vines as much alike as possible were selected.

The control showed infection on 89 per cent of the leaves. The second, treated only on the upper surface of the leaves with Bordeaux mixture, gave an infection rate of 69 per cent. The third, treated on the lower leaf surface only, showed no infection. The failure of fungicides to afford protection, recently much complained of by growers, is ascribed to a faulty mode of application and to the abundance of rain and dew.

The propagation of grape downy mildew, G. MOUNEYRÈS (*Prog. Agr. et Vit. (Ed. l'Est-Centre) 33 (1912), Nos. 30, pp. 100–110; 39, pp. 397–406; 40, pp. 426–434; 41, pp. 457–465*).—The author cites experimental and other evidence in support of the views that mildew infection takes place exclusively on the lower side of the leaf, as held by H. Faes and H. Müller-Thurgau (E. S. R., 26, pp. 550, 851), and that therefore wind coincident with moisture and an open level country, unbroken by variety of crops, by walls, hedges, etc., are all favorable to the dissemination of the spores and to consequent infection.

The author offers suggestions regarding cooperative measures for study and control of this disease, the spread of which is stated to be greatly favored by conditions in a large portion of the vine-growing districts of France.

Treatment of mildew, M. CERCELET (*Rev. Vit., 37 (1912), No. 960, pp. 629–633*).—The author briefly discusses the views and known facts in regard to the downy mildew of grapes, including conditions, modes, and results of

attack, and its treatment, in which it is held to be necessary to apply the fungicides to both leaf surfaces.

A study of the composition of grapes as a factor in resistance to attacks of Oïdium tuckeri, R. AVERNA-SACCÁ (*Bol. Agr. [São Paulo], 12. ser., 1911, No. 9–10, pp. 660–670; 13. ser., 1912, No. 1, pp. 56–68, fig. 1*).—This is a comparative study of several varieties of grapes in regard to their composition as affected by mildew and as related to the power of resistance thereto.

It was found that the American varieties were commonly resistant. This was attributed to their alleged higher content of acid. It is further stated that cultural means tend to lower their resistance to mildew as well as to other diseases.

Pasta Caffaro as a means of combating Peronospora on grapes, F. A. SANNINO (*Rivista [Conegliano], 5. ser., 18 (1912), No. 17, pp. 385–387*).—Pasta Caffaro, a fungicide offered for control of Peronospora, was tested in comparison with Bordeaux mixture. The spreading and adhering qualities are said to be satisfactory, and the efficacy as regards protection at 1 per cent concentration is said to be not inferior to that of Bordeaux mixture of 1 per cent strength of copper sulphate.

Roncet of American grapes in Sicily, E. PANTANELLI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 2–3, pp. 1–10*).—Continuing previous communications (E. S. R., 27, p. 750), the author briefly discusses the phenomena of roncet, its natural and experimental causation, its relation to soils, the resistance of certain varieties of grapes to its influence, and its transmissibility by both stock and graft, giving in tabular form numerous details of data obtained by him in the course of recent investigations. The article is in part a repetition of previous reports.

The formation and physiological significance of endocellular fibers in vines affected with roncet, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e. Nat., 5. ser., 21 (1912), I, No. 7, pp. 505–511, fig 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, p. 1445*).—Recent researches by the author on vines showing roncet are said to have established the facts that the first visible change in structure takes place in the cambium at the top of the stock and consists in an abnormal secretive process, giving rise to the endocellular fibers observed; that this degenerative change takes place slowly and progressively and can be localized during only a short time; and that in the first stage of the disease neither diminution of activity in the cambium nor change of the morphogenetic properties of the apical meristems is noticeable.

This degenerative condition, it is held, is the chief structural symptom of this disease, being transferable by grafting and persisting during its whole course. It is said to be of constant occurrence in all of the common American and Italian varieties of grapes. The external manifestations, it is claimed, may vary with different plants. Rachitis is said to be a second stage of the disease.

Fruit rots, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 9, pp. 649–653*).—The author briefly describes the life history of the brown rot of lemon and of the blue molds, and in comparison with these two, recently recognized Florida forms not yet known in California. These latter are the stem end rot due to *Phomopsis citri*, and the Diplodia rot (*Diplodia natalensis*). The former of these was found to infest 85 per cent of the fruit dropped in a well cared for but infected grove between October, 1910, and February, 1911. Spraying experiments gave no practical check to this disease. Suggested means of control include thorough pruning out of dead twigs and removal of dropped fruit. The Diplodia rot, principally a disease of packed fruit, is more rapid

in its development; and the same fungus is said to cause gummosis in both peach and citrus trees in Florida.

Citrus scab, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 11, pp. 833–842, figs. 9*).—This is an account of the citrus scab caused by *Cladosporium citri*, most of the information having been previously noted from another source (E. S. R., 27, p. 653).

Pseudomonas olivæ, W. MEYER (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 14–17, pp. 388–394, fig. 1*).—The author describes a fluorescent fungus found on olive, to which the name *P. olivæ* is given, as it is claimed that no description previously given exactly fits this form.

The chestnut blight disease (*Penn. Chestnut Tree Blight Com. Bul. 1, 1912, pp. 9, pls. 3*).—Means for identification of this disease are described, remedies suggested, and the need of cooperation to control and eradicate the blight is pointed out.

Blight on elm trees, J. ERIKSSON (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 4, pp. 225–233, pl. 1, figs. 3*).—Previously noted from another source (E. S. R., 27, p. 451).

The physiology and diseases of Hevea brasiliensis, T. PETCH (*London, 1911, pp. 268, pls. 16*).—In this book the author describes the structure and discusses the physiology of Hevea with special reference to the question of tapping the trees and the flow of latex. Different systems of tapping are described and the merits of each discussed in the light of experiments conducted in Ceylon and elsewhere. A chapter is given on general sanitation of the rubber plantation, after which the more important leaf, stem, and root diseases are described, and where definite means of control are known they are given. Various abnormalities of growth are briefly described, and a chapter is devoted to the effect of fungi and bacteria on prepared rubber. The work concludes with an enumeration of a considerable number of fungi which have been recorded on *H. brasiliensis*, many of the species being saprophytic only.

Damping off of coniferous seedlings, C. P. HARTLEY (*Abs. in Science, n. ser., 36 (1912), No. 933, pp. 683, 684*).—An abstract is given of a paper presented before the Botanical Society of Washington, in which the author states that, with the exception of cedars, damping off is a serious hindrance to the raising of coniferous seedlings. This disease is usually worst under moist conditions, but the author states that a well-drained nursery in southwestern Kansas has suffered especially heavy loss from damping-off parasites.

Pythium debaryanum appears to be the most common parasite in western nurseries, but in addition *Rhizoctonia* sp., *Fusarium* sp., and probably *Trichoderma lignorum* also cause damping off. Pythium and Rhizoctonia have been successfully inoculated on autoclave soil, but inoculations do not succeed uniformly on unsterilized soil, due probably to competition of bacteria and other fungi. Rhizoctonia loses its parasitism in cultures, and different strains were found to vary greatly in their virulence.

Pythium in nursery soil was easily killed by means of fungicides. Heat and fungicides which break down soon after application, such as mercuric chlorid, or acids and copper salts followed by lime, are not effective because Pythium often reinfects such soil, running through it rapidly before seedlings raised on it develop resistance. Excellent results have been obtained by treating beds before seeding with sulphuric acid and formalin, and on alkaline soils with zinc chlorid and copper sulphate. These fungicides seem to leave a slight residue in the soil, which protects against reinfection.

Protection of timber from Merulius lacrymans, E. PINOY (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 9, pp. 610, 611; abs. in Internat. Inst. Agr.*

[*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, p. 1064*).—The author's experiments are said to show that wood impregnated with a mixture of 2 per cent bichromate and 1 per cent fluorid of sodium, after drying and exposure to light, becomes completely resistant to fungus; that wood so treated and afterwards painted over with a solution of 5 per cent gelatin, 2 per cent potassium bichromate, and 0.5 per cent sodium fluorid, and then dried in exposure to light, takes on a brilliant solid polish and a brown mahogany color that imitates old wood; and that wood already attacked by fungus may be protected from further injury by sterilization, followed by a full treatment as above given. It is believed also that insect injuries may be prevented in this manner.

Further studies on the physiological effect of copper fungicides on vegetables and berries, R. EWERT (*Ztschr. Pflanzenkrank., 22 (1912), No. 5, pp. 257–285*).—In continuance of earlier studies (E. S. R., 16, p. 989; 17, p. 540), the author reports on his experiments with potatoes, radishes, bush beans, *Oxalis esculenta*, *Stachys tuberifera*, and cranberries.

Vegetable growth appears to be favored by the employment of Bordeaux mixture during a period of drought and strong sunshine. The results of the shading due to incrustation by the fungicide are said to be comparable to those obtained from partial shading by other means. This result of spraying also appears to delay the drying and fall of the leaves of some plants. Outside these results and the protection against fungi there is apparently no advantage to the plant from such application. The occasional sprinkling of the sprayed plants with water appeared rather injurious than useful. Heavy or strong applications of the fungicide were followed by lessened returns in case of potatoes and some other root crops.

Cranberries showed a marked increase of sugar content after being sprayed with from 1 to 4 per cent Bordeaux mixture. This result is thought to be due, not directly to increase of assimilation, but to decrease of transpiration. The sprayed berries, however, yielded more juice in some instances than did those not so treated. The results from plants sprayed while in bloom were very variable.

[Copper fungicides], R. SCHERPE (*Min. Bl. K. Preuss. Verwalt. Landw., Domänen u. Forsten, 8 (1912), No. 7, pp. 219–223*).—This is a discussion of fungicidal mixtures with copper as a basis, giving detailed directions regarding the quality of materials to be used and methods of preparation and application looking to economy and efficiency in combating plant diseases.

[A new treatment with lime-sulphur wash], L. SAVASTANO (*Bol. Arbor. Ital., 7 (1911), No. 3–4, pp. 193–218, figs. 6*).—A new formula is offered employing 1 kg. lime and 2 kg. of sulphur to 10 liters of water, with directions and suggestions regarding its preparation, quality and cost of materials, apparatus for spraying, etc. It is claimed that this mixture, prepared and used as recommended, forms a general field remedy, protecting against both fungi and insects at one and the same time. The results of two series of experiments are said to support, in general, this claim, but it is admitted that against rose rust and in some other cases the mixture proves ineffective or not readily applicable.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Zoological yearbooks, 1910, 1911, edited by P. MAYER (*Zool. Jahresber., 1910, pp. VIII+621; 1911, pp. VIII+615*).—These volumes, in continuation of the work previously noted (E. S. R., 24, p. 254), briefly review the literature issued during the years 1910 and 1911. As in previous volumes bibliographical lists are given, followed by summaries of the more important literature relating to the various groups of the animal kingdom.

State of New York forest, fish, and game law (*Albany, N. Y., 1911, pp. 295*).—This is an indexed pocket guide.

A squirrel destructor: An efficient and economical method of destroying ground squirrels, J. D. LONG (*Pub. Health Serv. U. S., Pub. Health Rpts., 27 (1912), No. 39, pp. 1594–1596, pls. 4*).—The author describes a pump which has been constructed for use in forcing bisulphid into squirrel holes. Its weight, loaded with 9 pt. of bisulphid (the capacity of the reservoir), is but 25 lbs. Only refined bisulphid, the price per gallon of which is the same as for the crude, is used in the apparatus, 15 cc. being required for each hole.

"The whole operation of inserting the hose, measuring the bisulphid, covering the hole, and pumping in the gas requires from 45 seconds to 1 minute and 10 seconds, depending upon the hardness of the ground. The average time is about 1 minute per hole. Laboratory experiments show that the animal is but little disturbed by the gas. He makes no effort to escape, does not struggle nor seek fresh air, and in from 10 to 15 minutes after the gas is pumped in falls over and in from 30 to 45 minutes is dead."

Experience thus far indicates that a man can average about 40 holes per hour in heavily infested ground, and about 30 holes per hour taking the ground as it comes. The cost per acre, where the average infestation is 10 holes per acre, is estimated at 20 cts., against 35 cts. for poisoned grain, and 68 cts. where the waste-ball method of applying carbon bisulphid is employed. It is stated that men using the pump have been able to treat from 200 to 250 holes with each gallon of bisulphid, whereas with the waste-ball method from 50 to 60 holes per gallon is considered good.

General index to a hand-list of the genera and species of birds, edited by W. R. OGILVIE-GRANT (*London, 1912, pp. IV+199*).—This is a general index to the 5 volumes of the Hand List of the Genera and Species of Birds, by R. B. Sharpe, previously noted (E. S. R., 23, p. 154.)

Index-catalogue of medical and veterinary zoology.—Subjects: Cestoda and Cestodaria, C. W. STILES and A. HASSALL (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 85, 1912, pp. 467*).—This catalogue consists of an alphabetical list of specific and subspecific names of Cestoda and Cestodaria (pp. 12–89), and a bibliography of supergeneric, generic, and specific names used in Cestoda and Cestodaria and of diseases caused by Cestoda and Cestodaria (pp. 90–461). Additional specific names and an additional generic and specific bibliography, taken from literature received after the manuscript had been completed, are appended.

Types deposited in the collection of the Massachusetts Agricultural College (In *Entomology and Zoology at the Massachusetts Agricultural College, Amherst, Mass., 1911, pp. 34–40*).—This list includes Orthoptera, Thysanoptera, Hemiptera, Lepidoptera, Diptera, and Hymenoptera.

[Report on the prevalence of some pests in the West Indies for 1910 and 1911], H. A. BALLOU (*West Indian Bul., 12 (1912), No. 4, pp. 412–425, 436–439*).—An account is given of the occurrence of the more important insect pests.

Report on economic zoology for the year ending September 30, 1911, F. V. THEOBALD (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 91–243, pls. 37, figs. 11*).—In this, the author's annual report (E. S. R., 25, p. 851), the occurrence of insects during the year is dealt with under the headings of animals injurious to fruit trees and bushes, corn, root crops, pulse, hops, vegetables, flowers, forest trees, those causing annoyance to man, and those injurious to buildings, furniture, stores, and food.

It is stated that the greater part of the year has been spent in investigating aphids. Mention is made of an ichneumonid parasite of the Mediterranean

flour moth found in certain English flour mills, which has been identified as *Olesicampa flavicentris*. See also a note by Froggatt (E. S. R., 27, p. 564.)

[Report of the entomologist of Uganda], C. C. Gowdey (*Ann. Rpt. Dept. Agr. Uganda, 1912, pp. 29–32*).—This report consists largely of brief accounts of the insects affecting cacao, cotton, coffee, citronella grass, etc.

[Report of the entomologist], H. Tryon (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1909–10, pp. 75–81*).—This report of the work of the year ended June 30, 1910, includes accounts of the occurrence of the more important insect pests.

Insects affecting the sugar cane in Trinidad, F. W. Urich (*Dept. Agr. Trinidad Bul., 11 (1912), No. 70, pp. 26–29*).—A brief account of the more important insect enemies of sugar cane.

Insects affecting the coconut palm in Trinidad, F. W. Urich (*Dept. Agr. Trinidad Bul., 11 (1912), No. 70, pp. 70–72; West Indian Bul., 12 (1912), No. 4, pp. 446–448*).—Several of the more important enemies of the coconut palm are considered.

Insect enemies of the pecan, W. W. Carroll (*Amer. Fruit and Nut Jour., 6 (1912), No. 97, pp. 75–77, 84, figs. 3*).—A brief account of the more important insect enemies of the pecan.

Insects infesting woolen tops, W. W. Froggatt (*Agr. Gaz. N. S. Wales, 23 (1912), No. 10, p. 900, pl. 1*).—It is stated that a second consignment of woolen tops (E. S. R., 28, p. 161) was found to be damaged by the cosmopolitan skin weevil, *Dermestes caäaverinus*.

The big brown cricket (Brachytrypes achatinus), C. C. Ghosh (*Mem. Dept. Agr. India, Ent. Ser., 4 (1912), No. 3, pp. 161–182, pl. 1, figs. 4*).—An account of the life history and habits of this pest, its natural enemies, and preventive and remedial measures. The species feeds at night and is the source of injury to jute, rice, tea plants in nurseries, indigo, etc. It is stated that in one village, out of 45 acres of indigo, 25 acres were entirely destroyed by this pest.

A series of campaigns against the rice grasshopper (Hieroglyphus banian), T. F. Main (*Agr. Jour. India, 7 (1912), No. 3, pp. 246–256, pls. 4*).—A report of operations in 1909, 1910, and 1911. See also a previous note by Coleman and Kannan (E. S. R., 27, p. 55).

The bean thrips (Heliothrips fasciatus), H. M. Russell (*U. S. Dept. Agr., Bur. Ent. Bul. 118, pp. 49, figs. 11*).—This bulletin, dealing with the biology of and injury caused by *H. fasciatus*, is based upon studies conducted during 1910 and 1911 at a field station established at Compton, Cal. It also includes observations of the life history and injury to alfalfa and cotton in the Imperial Valley, by V. L. Wildermuth, and additional observations in the more northern points of California, by P. R. Jones and S. W. Foster.

The attack of beans by this thrips results in the injured leaves turning yellowish or white, or drying up, and either dropping off or hanging lifeless to the plant. As the attack continues successive leaves are injured until in extreme cases the entire plant is killed. It is stated that in the summer of 1908 hundreds of acres of beans in southern California were seriously injured and had the appearance of plants scorched by fire. During the succeeding years, however, the injury has not been so severe. The other cultivated plants injured include beets, cabbages and other crucifers, lettuce, potatoes, tomatoes, peas, pears, alfalfa, and cotton. More than 20 wild food plants are recorded, of which the wild spiny lettuce (*Lactuca scariola*) seemed to be preferred, at least in the vicinity of Los Angeles.

At the present time this thrips is known to occur throughout the entire State of California, in several places in Arizona, in Nevada, and in Idaho near the Washington State line, and has been found in one locality in Tennessee. Speci-

mens have also been collected at Lincoln, Nebr., and at Urbana, Ill., on California oranges, having apparently been carried across the country while hibernating in the navel end of the fruit.

The longest period of oviposition observed was 46 days and the largest number of eggs laid by a single female was 134. "For localities with climatic conditions similar to those of Compton, the life cycle of this thrips will occupy during the early spring about 51 to 56 days, taking 20 days for the egg incubation, 17 to 19 days for the larval development, and 14 to 17 days for the prepupal and pupal stages. During the months of June to October the life cycle of this thrips will occupy from 28 to 43 days, taking 13 to 18 days for the egg stage, 10 to 14 days for the larval stage, and 5 to 11 days for the prepupal and pupal stages. During the rest of the breeding activity the life cycle must be even longer than in the spring, as in November, 1910, the prepupal and pupal stages alone occupied from 28 to 33 days, so that for the development of this insect during October, November, and the first of December at least 68 to 73 days must be required. In 1912 the adults began to emerge from hibernation at Hollywood, Cal., in January, and began oviposition at once. When this locality was visited on February 7, the adults were found to be feeding on the foliage of peas and beans in some numbers. . . . As the month of October appears, the adults become sluggish, do less feeding and lay fewer eggs, and apparently many enter hibernation." There is said to be a small generation both in early spring and late fall and 5 full generations during the rest of the time, making a total of 7 generations during the year.

The natural enemies mentioned include the internal parasite *Thripoctenus russelli*, accounts of which have been previously noted (E. S. R., 27, p. 262); *Chrysopa californica;* a syrphid fly (*Spærophoria sulphuripes*); the flower bug *Triphleps insidiosus;* a lady beetle (*Hippodamia convergens*); and a predaceous thrips, probably *Æolothrips fasciatus.*

In the case of crops planted over large areas and difficult or impossible to spray, such as beans, alfalfa, or cotton, cultural methods offer the most hope as a remedy. Clean cultivation should be practiced at all times in order that all weeds in the fields, along the edges of fields, in fence corners, and along the roads, which may serve as food plants, be kept down. Cotton and beans should not follow in old alfalfa fields if the latter were badly infested with the bean thrips, and fields of these crops should be removed as far as possible from the alfalfa fields. Where it is injuring alfalfa, disking and thorough renovation of the fields and good irrigation in order to give the plants as much chance as possible to make a quick growth are recommended. In case injury to fruit trees is threatened it can be controlled by using the distillate-oil stock emulsion spray, so successful against the pear thrips (E. S. R., 24, p. 455).

A bibliography of 14 titles is appended.

Notes on Thysanoptera, H. M. Russell (*Proc. Ent. Soc. Wash., 14 (1912), No. 3, p. 128*).—*Heliothrips rubrocinctus* was observed by the author in January, 1909, to be seriously injuring mango and avocado trees at Miami, Fla. Its habits are said to be almost identical with *H. hæmorrhoidalis*, with which it was found feeding. *Euthrips insularis*, collected on the velvet bean at Brownsville, Tex., was the source of considerable injury through its feeding on the blossoms. *Æolothrips bicolor* is reported to have been observed feeding on the onion thrips at Knox, Ind.

[The harlequin beetle, Macropus longimanus], A. Fredholm (*Proc. Agr. Soc. Trinidad and Tobago, 12 (1912), No. 7, pp. 227–229*).—This beetle occurs commonly in Brazil, Guiana, and other countries in tropical America. The larvæ have been found by the author to bore in the wood of the banyan tree.

The bedbug in a new rôle, R. E. Riggs (*Military Surg., 31 (1912), No. 3, pp. 279–288*).—The author presents evidence to show that the bedbug may be an agent in the transmission of typhoid fever.

Woolly aphid migration from elm to mountain ash, Edith M. Patch (*Jour. Econ. Ent., 5 (1912), No. 5, pp. 395–398, pl. 1*).—The author finds that the progeny of elm-leaf migrants develop on mountain ash and hawthorn as well as upon the apple.

"What influences the destination of the elm-leaf migrants and what determines their choice of the summer food plant for their progeny is not known. That they readily accept elm bark under some conditions Riley's account testifies. That they migrate to water shoots of apple, to mountain ash (*Pyrus* spp.), and to hawthorns (*Crataegus* sp.), there producing progeny known as the woolly aphid of the apple, I have had definite and repeated proof."

Elm-leaf curl and woolly apple aphid, Edith M. Patch (*Maine Sta. Bul. 203, pp. 235–258, pls. 3, figs. 8*).—This bulletin gives a detailed account of the life history and habits of the woolly apple aphis, also brief discussions of its insect enemies, and of preventive and remedial measures. As reported in preliminary accounts (E. S. R., 27, p. 555 and above) the author has found the woolly aphis of the apple, known as *Schizoneura lanigera*, to be the progeny of the spring migrants of *S. americana*, which produces the leaf curl of the elm.

"On the elm the stem mother, which hatches from the overwintering eggs sheltered in rough crevices of the bark, appears early in the spring and may be found in Maine before the middle of May stationed on the partly opened leaf buds. By the last of May the earliest of these wingless stem mothers are mature and found in the leaf curl or rosette, when a group of terminal leaves are affected, which they cause, producing the next generation, which are also wingless. In the summer great numbers of winged individuals are developed. From the fact that Riley recorded 7 consecutive generations on elm and the occurrence of what seems to be the elm bark feeding generations of the same species (known as *rileyi*) during the summer on tender elm bark, it would seem either that the migration from the elm leaves of these summer migrants is partly to apple bark and partly to elm bark or that elm bark colonies as well as leaf curl may be established by the first or second apterous generations. . . .

"This does not account for the generations resulting from the overwintering forms on the apple roots, as their sequence yet remains to be studied. The fall migration of the woolly aphid from apple and the mountain ash I have observed but I have not yet from observation linked it with the true sexes on elm. That inference, however, from the evidence of the spring migration to apple is unmistakable. . . .

"The fact of the migration from elm leaf to apple and mountain ash under normal out-of-door conditions was established during the summer of 1912. The migrants from the elm leaves settle on the underside of the apple leaves of water shoots and there produce nymphs which seek the stem and leaf axils and there congregate in woolly masses. The mountain ashes (*Pyrus americana* and introduced species) are favorite summer hosts in Maine. From one native mountain ash at Orono more than 400 such migrants were removed July 2 to July 12 from the ventral surface of the leaves, and about 150 thriving clusters of woolly aphid nymphs, the immediate progeny of these migrants, were established on the shoots of this single tree."

The danger of injury from the woolly aphis is greatest to nursery stock and young orchards. With the knowledge that the source of danger lies in the migrants from the previously unsuspected elm curl, it is possible to control the nursery stock by establishing nurseries at safe distances from susceptible elm trees or clearing out the elms from the vicinity of large nurseries.

In dealing with infested apple trees, the aphid masses on trunk and branch can be readily exterminated by the use of contact insecticides, such as tobacco decoction, kerosene emulsion, etc. In combating the more important root feeders, applications of strong soap and tobacco washes to the soil about the crown, or soot, ashes, or tobacco dust buried about the roots are effective. A predaceous capsid (*Camptobrochis nitens*), larvæ of a coccinellid, and syrphid maggots are said to be very abundant in Maine, feeding on the aphids while in the elm-leaf curl.

An annotated synonymic bibliography is appended.

The aphids on mangolds and allied plants. F. V. THEOBALD (*Jour. Bd. Agr. [London], 19 (1912), No. 6, pp. 466–476, pls. 2, fig. 1*).—Four species of aphids were found by the author on mangolds and allied plants in several parts of the southeast of England, *Aphis rumicis* and *A. atriplicis* being the most common. It is stated that the aphids of sugar beet and mangold, described by Jablonowski[a] under the names of *A. papaveris*, *A. rumicis*, *A. evonymi*, *A. chenopodii*, and *A. atriplicis*, represent in reality but 2 species, the first 3 and the last 2 being the same.

"The complete life cycle of the black aphis (*A. rumicis*) does not appear as yet quite clear, but there is no doubt that it passes the winter in the egg stage on the Euonymus, where it hatches and becomes what is called *A. euonymi;* later it flies to poppies and becomes *A. papaveris*, and then, in certain years, when abnormal increase takes place, to mangolds, etc., returning to the Euonymus in autumn for the sexual stages.

"At the same time there is another life cycle, for I have found *A. rumicis* ovipositing on the stalks of Rumex, often in considerable numbers, and also amongst the seed heads. The progeny of the last fly chiefly to beans. A black aphis also oviposits on gorse, but in the absence of winged specimens I am unable to say whether it is *A. rumicis* or the aphis described by Fabricius as *A. ulicis*. I believe, however, that these are the same. With regard to *A. atriplicis*, the species appears to pass the whole of its life cycle on wild and cultivated Chenopodiaceæ. Nothing is known of the bionomics of the other species."

References to the literature are appended.

A fungus parasite of the mealy bug (*Porto Rico Prog., 3 (1912), No. 20, p. 5*).—Field observations by D. L. Van Dine show that an undetermined species of Aspergillus is parasitic to some extent upon the sugar cane mealy bug and apparently destroys both the immature and adult stages.

A catalogue of the Lepidoptera, edited by C. AURIVILLIUS and H. WAGNER (*Lepidopterorum Catalogus. Berlin, 1911, pts. 1, pp. 4; 2, pp. 14; 3, pp. 12; 4, pp. 26; 1912, pt. 5, pp. 82*).—These parts catalogue the Lepidoptera as follows: Part 1, by C. Aurivillius, the Chrysopolomidæ; parts 2 and 3, by A. Pagenstecher, the Callidulidæ and Libytheidæ, respectively; part 4, by H. Wagner and R. Pfitzner, the Hepialidæ; and part 5, by E. Strand, the subfamily Agaristinæ of the Noctuidæ.

A catalogue of the Lepidoptera, edited by H. WAGNER (*Lepidopterorum Catalogus. Berlin, 1912, pts. 6, pp. 68; 7, pp. 179; 8, pp. 94; 9, pp. 22*).—In continuation of the work noted above, part 6, by E. Meyrick, catalogues the Adelidæ, Micropterygidæ, and Gracilariadæ; part 7, by H. Zerny, the Syntomidæ; part 8, by L. B. Prout, the subfamilies Brephinæ and Œnochrominæ of the Geometridæ; and part 9, the subfamily Pyrrhopyginæ of the Hesperidæ, and the Megathymidæ, by P. Mabille and McDonnough, respectively.

[a] Die Tierischen Feinde der Zuckerrübe. Budapest, 1909, pp. 215–231.

Catalogue of the Lepidoptera Phalænæ in the British Museum.—XI, Catalogue of the Noctuidæ in the collection of the British Museum, G. F. Hampson (*London, 1912, vol. 11, pp. XVII+689, pls. 18, figs. 275*).—This part (E. S. R., 25, p. 557) takes up the subfamilies Eutelianæ, Stictopterinæ, Sarrothripinæ, and Acontianæ.

Papers on cereal and forage insects.—The alfalfa looper in the Pacific Northwest (Autographa gamma californica), J. A. Hyslop (*U. S. Dept. Agr., Bur. Ent. Bul. 95, pt. 7, pp. 109–118, pl. 1, figs. 7*).—The attacks on alfalfa and clover in the Palouse region of Washington and Idaho by this insect are said to have attracted the attention of many ranchers, although its depredations have not as yet been sufficient to cause much loss. The larvæ are usually very numerous in the early spring and gradually increase in numbers until the first hay cutting, when they appear to reach the maximum. They do not appear to be inconvenienced by the removal of the hay crop as they at once turn their attention to the young second growth, on which larvæ are to be found throughout the summer until the early frosts. Up to the present time the alfalfa looper has been held in check by its natural enemies.

The alfalfa looper has been collected in California, Colorado, Nevada, Washington, Wyoming, Idaho, and British Columbia. In addition to alfalfa and clover, it has been found to feed on cabbage, barley, elder (*Sambucus* sp.), dock (*Rumex* sp.), *Malva rotundifolia*, and garden peas. In the Palouse region of Washington it passes the winter in the pupal stage and probably also as an adult. The larvæ become numerous in the fields early in June. While young they feed upon the epidermis of the leaves, skeletonizing them and giving to the attacked plant a brownish appearance. The older larvæ—that is, after the third molt—eat from the edge of the leaf toward the midrib, entirely consuming the leaves. The larval period lasts about 2 weeks, there being 5 molts with periods of about 3 days elapsing between each. When ready to pupate the larva spins a loose white silken cocoon among a number of leaves, usually well up in the plants, incorporating 2 or 3 leaves in its structure. The length of the pupal stage in the laboratory is very uniformly 10 or 11 days. "Thus the time elapsing from egg laying until the adult emerges covers a period of from 26 to 48 days, probably about 30 days in the Palouse country of Washington. . . . There are 2 generations, and probably 3 in the case of the earlier appearing individuals, and larvæ in all instars are to be found in the field as late as the end of August, but these very late larvæ probably succumb during the winter." Technical descriptions are given of the several stages.

Five hymenopterous and 2 dipterous parasites were reared at the field laboratory at Pullman, Wash., and a disease was observed during the seasons 1909 and 1910. The parasites have been identified as *Rhogas autographæ*, *Microplitis* n. sp., *Sargaritis websteri*, *Ameloctonus* n. sp., *M. alaskensis*, *Plagia americana*, and *Phorocera saundersii*.

The leopard moth, F. J. Seaver (*Jour. N. Y. Bot. Gard., 13 (1912), No. 154, pp. 155–160, pls. 3*).—An account of the life history, plants attacked, methods of detecting its presence, and means of control of *Zeuzera pyrina*.

Stimulating silk production in Manchuria, A. W. Pontius (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 276, p. 976*).—It is stated that the wild silkworm in South Manchuria thrives best on the oaks *Quercus dentata* and *Q. serrata* and the palmyra palm.

Contributions to the natural history of the Lepidoptera of North America, W. Barnes and J. H. McDunnough (*Decatur, Ill., vol. 1, 1911, Nos. 1, pp. 35, pls. 7; 2, pp. 17, pls. 4; 1912, No. 3, pp. 43, pls. 6*).—These parts consist of a

Revision of the Cossidæ of North America, The Lasiocampid Genus Gloveria and Its Allies, and a Revision of the Megathymidæ, respectively.

Gyrococcus flaccidifex and the flacherie. W. REIFF (*Science, n. ser., 36 (1912), No. 929, pp. 515, 516*).—This is a discussion of the paper by Glaser and Chapman previously noted (E. S. R., 27, p. 660).

A study of mosquitoes in San Juan, Porto Rico. W. V. TOWER (*Porto Rico Sta. Circ. 14, pp. 5–23, fig. 1*).—The first part of this circular discusses the breeding habits of mosquitoes. During 1906 the author collected the larvæ of *Aedes mediovittata, Culex bisulcatus, Chironomus anonymus, A. (Stegomyia) calopus, Culex taweri, C. quinquefasciatus,* and *C. similis* in Mayaguez. Although malaria exists on the island the author states that he has not as yet collected specimens of Anopheles.

The second part reports upon a mosquito survey of the city of San Juan made during the latter part of March and early April, 1911. The author thinks it is very probable that the mosquitoes found in San Juan nearly all breed within its limits. The recommendations submitted to the city of San Juan following the survey are appended.

Life histories of Syrphidæ, III, IV. C. L. METCALF (*Ohio Nat., 12 (1912), Nos. 5, pp. 477–488, pl. 1; 8, pp. 533–541, pl. 1*).—This is a continuation of the paper previously noted (E. S. R., 26, p. 349).

In part 3 the author deals at length with the life history of *Syrphus americanus*, one of the most common species occurring in Ohio. The adults are especially abundant about all kinds of blossoms during July and August, as well as very early in the spring. The larvæ, which are active and greedy, prey on a number of different aphids in large numbers, including the cabbage aphis (*Aphis brassicæ*), the European grain aphis (*Siphocoryne avenæ*), occasionally among *A. rumicus* on curled dock (*Rumex crispus*) and broad-leaved dock (*R. obtusifolius*), and the willow grove plant louse (*Melanoxanthus solicitii*). Females taken on May 8 laid, on the same and the following day, from 35 to 40 eggs each. Indoors at a temperature of about 90° F. the eggs hatched in from 55 to 60 hours. With plenty of food at hand the larval period from hatching to formation of puparium was from 8 to 9 days, but when less food was supplied the period was frequently extended to 2 weeks and sometimes 20 days. The pupal stage is for the most part passed in the same location as the larval, the puparia being glued to the leaves of cabbage and among flower and leaf axils of *R. crispus*. Some of the specimens kept on potted cabbage were found as pupæ buried under a half inch or more of soil in the pot. The winter is sometimes passed in the pupal stage but whether this is the only method of wintering the author is not prepared to say. The ichneumonid parasite *Bassus lætatorius*, reared by the author, proved to be a serious enemy of *S. americanus*, at times 75 per cent of those collected being destroyed. This parasite oviposits through the body wall of the larvæ, and the eggs hatch and the larvæ develop without preventing the formation of a more or less complete puparium by the host. Only 1 parasite develops in each host individual.

The life history of 2 species, namely, *Allograpta obliqua* and *Syrphorophorus cylindrica*, are taken up in the fourth paper. *Allograpta obliqua* was found to begin oviposition about the middle of May, nearly 100 eggs being deposited by a female that was taken on May 17, and from 2½ to 3½ days being passed in the egg stage. In the field the eggs were found on persimmon trees the last of May and on curled dock (*R. crispus*) on June 16–18. The eggs are deposited singly and laid flat on the surface of the leaf, twig, or flower. The larvæ were found abundant on the leaves of flowers and fruit of the persimmon June 1 and 2, feeding on the nymphs of an undetermined species of Aleyrodidæ which caused a curling of the leaves. An autumn generation occurs commonly on

cabbage and related plants where they are predaceous on *A. brassicæ*, the larvæ being taken from this host plant from September 20 to October 10. The larvæ were also taken from among colonies of *A. rumicus* on curled dock, June 16–18. They are not closely restricted in their food habits, attacking at least 2 species of Aphididæ and 1 of Aleyrodidæ. They live entirely on the surface of the plants where they are found and probably do not move farther than is necessary to secure their food. The duration of the pupal stage in specimens taken from persimmons in the spring varied in captivity from 3½ to 5½ days, while in autumn in specimens from cabbage the duration of the pupal stage was in some cases as long as 10 days. Numerous larvæ of the autumn generation on cabbage are parasitized by the small ichneumonid *B. lætatorius*.

Larvæ of *S. cylindrica*, which closely resemble the larvæ of *Allographta obliqua*, were taken by the author in June from among *A. brassicæ*, and were commonly found on curled dock, and on cabbage in gardens during September. The cabbage aphis seemed to be the favorite prey. The duration of the pupal stage was from 5 to 7 days. The larva is parasitized by *B. lætatorius*.

Ants destroying larvæ of flies, G. P. Stallman (*Military Surg., 31 (1912), No. 3, pp. 325, 326*).—The author reports observations of the destruction of fly larvæ by red ants at Nogales, Ariz.

The house fly in its relation to city garbage, J. H. Paine (*Psyche, 19 (1912), No. 5, pp. 156–159*).—In investigations conducted in a Boston tenement district the author found various species of muscids, including a large percentage of house flies, swarming about garbage, depositing eggs and feeding upon it and upon other refuse thrown into the alleys. Larvæ were collected from the contents of various pails as they were emptied into the carrier's wagon, being as a rule found in quantities and often so abundant that the interior of the receptacle appeared as a wriggling mass. They were taken to a laboratory and placed in covered boxes containing a little earth in which they could pupate, and were fed upon stale water-soaked bread. Of 649 specimens reared to adults, 22.4 per cent were *Musca domestica*, 22.3 per cent *Phormia regina*, 50.5 per cent *Lucilia sericata*, 4.4 per cent *Calliphora erythrocephala*, and 0.1 per cent *Muscina stabulans*.

On the influence of meteorological conditions on the development of Trypanosoma rhodesiense in Glossina morsitans, A. Kinghorn and W. Yorke (*Brit. Med. Jour., 1912, No. 2701, pp. 835–837*).—"The developmental cycle of *T. rhodesiense* in *G. morsitans* is, to a marked degree, influenced by the temperature to which the flies are subjected. High temperatures (75–85° F.) favor the development of the parasite, while low temperatures (60–70°) are unfavorable."

The yellow currant fly or gooseberry fruit fly (Epochra canadensis), J. H. Paine (*Psyche, 19 (1912), No. 5, pp. 139–144, pls. 2*).—This is a brief account of the life history and habits of the yellow currant fly as observed in the San Francisco Bay region of California.

On the length of life of the rat flea apart from its host, W. Nicoll (*Brit. Med. Jour., 1912, No, 2702, pp. 926–928*).—The author's experiments have led to the following conclusions:

"The average length of life of *Ceratophyllus fasciatus* apart from its host under general circumstances is just under 7 days, but about 9 per cent live for a fortnight and at least 2 per cent for 3 weeks or over; (of 505 fleas 46 lived at least 14 days and 10 at least 21 days). Other things being equal, they live longer in winter than in summer, that is, longer at low temperatures than at high. Under ordinary circumstances, when the temperature is over 15° C.

for any considerable part of the time, it would be exceptional for them to live, without feeding, for more than 40 days, but . . . it is evident that in winter when the temperature remains continuously under 10°, they may remain alive for as long as 2 months and if the temperature is maintained continuously at freezing point this period may be extended to over 10 weeks. . . .

"Material infected with fleas and larvæ may remain infected for as long as a year. This appears to be due to the fact that the larval and pupal stages in the development are greatly prolonged under the adverse conditions. Dampness, however, rapidly kills off both fleas and larvæ. No direct evidence was obtained that the fleas bred under these conditions; but the appearance of the larvæ toward the end of some of the experiments suggests that they did breed to some extent. Fleas derived from the infected material readily attacked rats, and proceeded to multiply in the course of a short time."

A catalogue of Coleoptera (*Coleopterorum Catalogus. Berlin, 1912, pts. 40, pp. 191–288; 41, pp. 46; 42, pp. 11; 43, pp. 66; 44, pp. 26; 45, pp. 84; 46, pp. 47; 47, pp. 85–134*).—In continuation of this work (E. S. R., 27, p. 759) part 40, by M. Bernhauer and K. Schubert, catalogues the Staphylinidæ III; part 41, by M. Pic, the Ptinidæ; part 42, by A. Schmidt, the subfamilies Ægialiinæ and Chironinæ of the Scarabæidæ; part 43, by G. J. Arrow, the subfamilies Pachypodinæ, Pleocominæ, Aclopinæ, Glaphyrinæ, Ochodæinæ, Orphninæ, Idiostominæ, Dynamopinæ, Hybosorinæ, Acanthocerinæ, and Troginæ of the Scarabæidæ; part 44, by H. Strohmeyer, the Platypodidæ; part 45, by K. W. von Dalla Torre, the subfamily Melolonthinæ I, of the Scarabæidæ; part 46, by A. Boucomont, the subfamilies Taurocerastinæ and Geotrupinæ of the Scarabæidæ; and part 47, by K. W. von Dalla Torre, the subfamily Melolonthinæ II, of the Scarabæidæ.

Willow and poplar leaf beetles, R. S. MacDougall (*Jour. Bd. Agr. [London], 19 (1912), No. 7, pp. 554–560, pl. 1, figs. 5*).—A brief account is given of the more important species.

A sugar-cane pest in St. Croix (*Agr. News [Barbados], 11 (1912), No. 274, p. 346*).—This note relates to *Strategus titanus*, which burrows into the bases of cane shoots, eating its way upwards, and turning the cane into a hollow tube. Sweet potatoes and other plants are also attacked. It is said to feed on dead as well as living plant tissue.

How shall we fight the destructive white grub? R. D. Glasgow (*Prairie Farmer, 84 (1912), No. 20, pp. 9, 35, figs. 2*).—This popular account is accompanied by a chart showing the complete life cycle of the white grub.

Papers on insects affecting stored products.—The cowpea weevil (Pachymerus chinensis), F. H. Chittenden (*U. S. Dept. Agr., Bur. Ent. Bul. 96, pt. 6, pp. 83–94, pl. 1, fig. 1*).—This weevil resembles the four-spotted bean weevil (*P. quadrimaculatus*) superficially in appearance, both injuring the seed in much the same manner as does the common bean weevil. "Like that species they begin operations in the field, and continue to breed for successive generations in the stored seed until they entirely spoil it for food and seriously impair its germinating power. Both species are generally distributed and injurious in the South, and are widening their range with the increasing use of their food plant."

In 1911 *P. chinensis* was the prevalent species in cowpeas in the Norfolk region of Virginia and the author considers it fairly certain that it is capable of establishing itself wherever its food plant will grow.

"This species is seemingly capable of breeding on most forms of edible legumes, infesting practically all of the cowpeas and beans and their numerous varieties, 'Adsuki' beans (*Phascolus radiatus*), pigeon peas (*Cajanus indica*), garden and field peas, lentils, chickpeas (*Cicer arietinum*), and the Ceylonese

seeds known as 'gram' or 'mung' and in their native home as 'kolu' and 'muneta,' *P. mungo*. We have reared it from *Vigna catjang* and *V. unguiculatus* of many varieties, *V. sinensis*, and *Dolichos biflorus*, and the species has been collected in fields of broad beans."

"The eggs are deposited on the outside of the growing pods in the field and upon the dried seeds, and are attached by a glutinous substance which covers the egg and extends somewhat around it. The larvæ hatch from them in 4, 5, or more days, depending upon the season, temperature, and other circumstances, and burrow into the pods to the developing seed, which they penetrate. In 2 or 3 weeks in midsummer weather, and in about 2 months in cooler weather, they attain full growth, when they present much the same appearance as the larvæ of other bean and pea weevils. The pupal state lasts from about 4 or 5 days in warm weather to considerably longer in cooler weather, whereupon the beetle form is assumed. . . . The first brood which develops in the field attains maturity by about the third week of September, or perhaps earlier. . . . In a fairly warm indoor temperature 6 or 7 broods probably develop annually in a latitude like that of Washington, D. C." In a warm room with an average temperature of about 70° F., this species was kept breeding throughout the winter. A new generation was obtained June 24 from a pair of weevils confined in a rearing jar with chickpeas on May 23, a period of 32 days having intervened. Another experiment was made in a hot room during the latter part of June and July, and the entire life cycle from egg to adult was passed in 21 days.

Bisulphid of carbon and hydrocyanic acid gas fumigation are recommended for use in controlling the pest. The hot-water remedy, dry heat, and the introduction of parasites from localities where these are established into others where they are not known to occur, are all desirable.

A bibliography of 22 titles is appended.

Bees and bee keeping, J. DE BOER (*Las Abejas. Mexico: Govt., 1912, 2 ed., pp. 128, pls. 70*).—This is a practical guide

The spider book, J. H. COMSTOCK (*Garden City, N. Y., 1912, pp. XV+721, pls. 2, figs. 769*).—A manual for the study of the spiders and their near relatives, the scorpions, pseudoscorpions, whip-scorpions, harvestmen, and other members of the class of Arachnida, found in America north of Mexico, with analytical keys for their classification and popular accounts of their habits. The chief object of this work is to furnish an introduction to the study of the structure, classification, and habits of spiders.

The subject is taken up under the following headings: Spiders and their near relatives (pp. 3–94); the external anatomy of spiders (pp. 95–136); the internal anatomy of spiders (pp. 137–176); the life of spiders (pp. 177–217); the order Araneida or spiders (pp. 218–227); the superfamily Avicularioidea or tarantulas (pp. 228–256); and the superfamily Argiopoidea or true spiders (pp. 257–700).

A list is appended of books and papers to which reference has been made.

Notes on parasites found in frogs in the vicinity of St. Paul, Minn., H. L. OSBORN (*Proc. Ind. Acad. Sci., 1909, pp. 351, 352*).—It is stated that the lungs of frogs collected in the neighborhood of St. Paul contain *Distomum lanceolatum* in a large percentage of cases and a nematode also in many instances.

FOODS—HUMAN NUTRITION.

A laboratory handbook for dietetics, MARY S. ROSE (*New York, 1912, pp. VIII+127+6*).—The first part of this volume, which is designated for the use of students of nutrition, has to do with food values and food requirements; the second part with problems involved in dietary calculations; and the third with

reference tables. An appendix presents data regarding the equipment of a dietetics laboratory.

It has been the author's purpose "to explain the problems involved in the calculation of food values and food requirements and the construction of dietaries and to furnish reference tables which will minimize the labor involved in such work without limiting dietary study to a few food materials."

Digestion experiments with Holland cheese, G. LEBBIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 5, pp. 335, 336*).—According to the experimental data reported, the dry matter of cheese had practically the same digestibility as the dry matter of milk.

[Finnish egg cheese], J. H. MONRAD (*Hoard's Dairyman, 44 (1912), No. 19, p. 588, fig. 1*).—The making of sour curd or sour-milk cheeses which contain eggs is described.

Wheat bran, A. E. GALLANT (*N. Y. Med. Jour., 96 (1912), No. 9, pp. 414–417, figs. 5*).—A paper read before the Medical Association of the Greater City of New York.

The value of bran in food is discussed. Its high content of salts and of phytinic acid, and its value in counteracting a tendency toward constipation, are noted.

Food uses of the peanut, Mrs. W. N. HUTT (*Amer. Fruit and Nut Jour., 6 (1912), No. 98, pp. 108, 109*).—In this summary of data the author calls attention to the fact that in the Southern States where they are grown peanuts are commonly eaten raw.

[Green vegetables, fruits, and milk as possible sources of typhoid fever], L. L. LUMSDEN and J. F. ANDERSON (*Pub. Health and Mar. Hosp. Serv. U. S., Hyg. Lab. Bul. 78, pp. 196, pls. 18, figs. 24*).—In Report No. 4 on the origin and prevalence of typhoid fever in the District of Columbia (1909–10) much information is given regarding the possible relation of food materials to the spread of this disease. The possibility of spreading the disease by means of milk, ice cream, raw shellfish, raw fruits (strawberries), and raw vegetables is discussed, as well as by flies, by water, by personal contact, and in other ways.

Quotations follow from the recommendations which were made for the District of Columbia, on the basis of the investigations reported:

"The pasteurization of the general milk supply and the sterilization of all bottles, cans, and other containers of milk for public sales; both the pasteurization of the milk and the sterilization of the containers to be conducted under official supervision.

"The enactment of legislation prohibiting the sale, offering for sale, or preparation for sale . . . of any milk which contains before pasteurization more than 500,000 bacteria to the cubic centimeter. The adoption of a standard bacterial content for milk labeled as 'pasteurized' is suggested so that anyone would be subject to prosecution who sold or offered for sale milk advertised as having been pasteurized but which could be demonstrated by bacteriological examination either to have been improperly pasteurized or to have been improperly handled thereafter.

"The enactment of legislation prohibiting the sale or the offering for sale . . . of any milk or any green garden truck obtained from farms not provided with either sanitary privies or sanitary water-closets.

"The enforcement, as rigid as is practicable, of measures directed toward the prevention of contamination of any foods or beverages whatsoever . . . by fingers or flies soiled with the excreta from persons."

Preserved fruits, A. ROLET (*Les Conserves de Fruits. Paris, 1912, pp. 494, figs. 173*).—Domestic and commercial methods of preserving fruits are described in this handbook.

Culinary herbs, M. G. KAINS (*New York and London, 1912, pp. 12+143, pl. 1, figs. 44*).—This describes the cultivation and use of culinary herbs.

The food inspector's encyclopedia, A. H. WALKER (*London, 1912, pp. VI+303+2*).—As stated in the preface, it has been the author's purpose in compiling this volume, which is in form an encyclopedic dictionary, to collect information of value and interest to those engaged in public health work. The material has been arranged alphabetically.

[Pure food topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 6, pp. 97–104, 105–112*).—The results are reported of the examination of sanatogen, a proprietary preparation, and of a number of foods and beverages, drug products, etc.

Federal inspection of food in Canada, A. MCGILL (*Proc. and Trans Roy. Soc. Canada, 3. ser., 5 (1911), pp. LXXI–LXXXIV*).—This is a historical summary of food inspection in Canada, with a discussion of the commonest adulterants of foods.

Variations in Indian price levels from 1861 to 1911 expressed in index numbers (*Calcutta: Com. Intel. Dept., 1912, pp. 16, pls. 5*).—Food grains are included in this summary of statistical data.

The successful home cook, LUCY H. YATES (*London [1910], pp. VIII+243+4*).—In addition to recipes and general discussions of methods of cookery and similar topics, the author has summarized information regarding the arrangement and equipment of small kitchens.

Domestic economy of Finnish workmen, J. H. SNODGRASS (*Daily Cons. and Trade Rpts. [U. S.], 15 (1912), No. 288, p. 1231*).—A summary based on a Finnish publication reporting an investigation made by a woman factory inspector of the conditions of life of Finnish workmen.

Information is given regarding income and expenditure and the proportionate expenditure for different articles of food and for rent. Comparison is also made of the distribution of expenditure of laborers' income in Finland and in other countries.

A dangerous practice in the feeding of infants (*Quart. Bul. Bd. Health N. H., 1 (1912), No. 4, p. 65*).—It is stated that "the so-called vacuum bottles, designed to maintain liquids at a desired temperature, either hot or cold, for several hours, are being used to keep the baby's milk warm for feeding through the night or on a journey, or for other convenient periods.

"The result of keeping warm milk in such bottles for several hours is the development of bacteria in immense numbers, consequently rendering the milk dangerous for infants."

It is pointed out that no medium is better suited for the rapid growth of bacteria than warm milk, and accordingly many municipalities have established regulations requiring milk to be cooled immediately after being drawn from the cow, and to be delivered to the customer at a temperature not exceeding 50 or 55° F.

A low temperature is necessary to inhibit the growth of micro-organisms, to prevent early souring, decomposition and other detrimental changes. "It will, therefore, be seen that the keeping of warm milk for several hours in one of the receptacles referred to is the exact reverse of reasonable sanitary precautions to preserve milk in a safe and palatable condition.

"The changes that take place in milk at a comparatively high temperature are such that when fed to infants frequently result in digestive disturbances, diarrhea and other pathological conditions, often terminating fatally."

Attention is directed to a statement that warm milk should not be kept in such a receptacle as a vacuum-jacketed bottle unless the milk has been previously pasteurized or sterilized. Furthermore, the practice recommended is to

keep the milk cold in one bottle, and hot water in another, and at feeding time to mix the milk and hot water in proper proportions, this procedure to be followed only in accordance with the advice of a physician.

Food requirements of an adult man in relation to the muscular work performed, R. TIGERSTEDT (*Fortschr. Naturw. Forsch., 5 (1912), pp. 246–300, figs. 8*).—An exhaustive digest of historical and other data, with a bibliography.

Feeding experiments illustrating the importance of accessory factors in normal dietaries, F. G. HOPKINS (*Jour. Physiol., 44 (1912), No. 5-6, pp. 425–460, figs. 7*).—Experiments with rats showed that these animals did not grow when fed mixtures of pure fats, proteins, carbohydrates, and salts, but that they did grow when an extremely small amount of normal foodstuffs, such as milk, was added to the diet.

This effect could not be ascribed to the effect of increased appetite. Addition of a small quantity of milk reduced the food consumption necessary to maintain a given weight increment to one-half or less.

Concerning the physiology of metabolism in boyhood with special reference to certain mineral constituents, O. HERBST (*Jahrb. Kinderheilk., 76 (1912), Ergänzungsh., pp. 40–130; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 18–19, pp. 736, 737; Zentbl. Expt. Med., 2 (1912), No. 15, pp. 696, 697*).—Extended experiments with normal boys from 6 to 14 years of age were undertaken to ascertain the balance of income and outgo of potassium, magnesium, and phosphoric acid; to study the relations of mineral substances to one another and to different foodstuffs; to supplement earlier figures regarding nitrogen and fat metabolism and energy supply; and to study the normal composition of feces; the results being discussed in comparison with the results obtained with 2 children who were not in normal health.

In the data recorded, the daily protein intake ranged from 2.1 to 3.3 gm., the fat from 2.5 to 3.6 gm., and the carbohydrates from 7.7 to 10.7 gm. per kilogram of body weight.

According to the author, the protein supplied was more than twice as great as the physiological requirement. The nitrogen retention was very good, and apparently with all the children there was actual growth. With healthy children from 6 to 8 years of age, from 72 to 74 calories per kilogram of body weight was calculated as necessary to insure metabolic balance and growth.

The phosphorus consumption was 3 gm. per day, of which half was recovered in the urine and one-fifth in the feces. The remainder was retained, namely, from 0.5 to 1 gm. P_2O_5 per day. The author remarks that naturally such a quantity would not be retained each day throughout the year, but only at intervals.

The daily diet supplied from 1 to 1.4 gm. potassium.

The total amount of calcium taken per day (from 1.072 to 1.385 gm., or 0.0335 to 0.0483 gm. CaO per kilogram of body weight) was greater than the body requirement. A noticeable part of the calcium of the diet was supplied in the water used for table and cooking purposes.

With healthy children, the greater part of excreted calcium was found in the feces. With others, and particularly with nervous children, there was a relative decrease in the amount excreted through the intestine and an increase in the amount excreted in the urine.

With from 0.3 to 0.37 gm. in the daily diet of the younger and from 0.41 to 0.48 gm. in the daily diet of the older boys, in all cases a positive magnesium balance was noticed.

On an average, from 5.7 to 9.6 gm. common salt was supplied per day, which was fully adequate for the requirements. Salt was chiefly excreted in the urine,

and it appeared that with children, as with adults, only a few decigrams per day were excreted in the feces under usual conditions. On the other hand, relatively larger amounts of potassium were excreted in the feces.

A bibliography is included and the results of the author's extended investigations are discussed in comparison with the work of other observers.

The physiology of water and salt, O. Cohnheim et al. (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 2, pp. 62–88, fig. 1; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 596, II, p. 572*).—A stay of a few days on Mt. Rosa did not increase red corpuscles or hemoglobin in either men (the authors) or in dogs.

Loss of body weight is ascribed to unhygienic conditions. Marked retention of chlorin followed profuse perspiration. The influence of varying amounts of sodium chlorid and water in the food is discussed.

The influence of potassium salts on purin metabolism in mammals, H. Lubieniecki (*Arch. Expt. Path. u. Pharmakol., 68 (1912), No. 5, pp. 394–400; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 16–17, p. 661*).—Experiments were made in which dogs and rabbits were given potassium chlorid subcutaneously and intravenously, also experiments in which man was given potassium lactate per os.

In 9 out of 16 tests, a decrease in the allantoin in uric acid excretion was noted, in 4 cases an increase, and in 3 no effect.

The substance from yeast and certain foodstuffs which prevents polyneuritis (beriberi), C. Funk (*Brit. Med. Jour., 1912, No. 2700, pp. 787, 788*).—The data reported have for the most part been noted from another source (E. S. R., 27, p. 868). The name "vitamin" is proposed for the substance isolated, which is analogous to uracil and thymin. A structural formula is proposed.

The influence of the ingestion of spices upon the excretion of hippuric acid, H. E. Barnard (*Ann. Rpt. Ind. Bd. Health, 29 (1910), pp. 312–321, dgms. 2*).—The effect upon the hippuric acid content of the urine of the addition of 7 oz. of well spiced tomato catsup was determined. The problem appears to have a bearing on the question of the use of sodium benzoate as a preservative.

No increase in the production of hippuric acid was found to result from ingestion of the spiced catsup. The author concludes that "the results must be taken as indicative of the fallacy of the theory that the essential oils of spices are oxidized to benzoic acid in the course of metabolism, for if this were the case the hippuric acid excreted would, under the conditions imposed, have showed a decided rise during the 7 days when the subjects were taking the spiced catsup."

Experiments on the minimum nitrogen content of the normal diet in rest and at work, U. Folena (*Ann. Ig. Sper., n. ser., 22 (1912), No. 2, pp. 297–396, figs. 20*).—The work of previous investigators is reviewed, especially that of the low protein advocates.

The author concludes from his own experiments, which are presented in detail, that the ordinary daily ration should contain from 0.7 to 0.9 gm. of protein per kilogram of body weight (from 47.7 to 61.4 gm. per 150 lbs.)

An extensive bibliography is given.

The comparative effect of light and dark meat upon the secretion of uric acid and other nitrogenous constituents in urine, A. von Siewert and E. von Zebrowski (*Ztschr. Klin. Med., 75 (1912), No. 3–4, pp. 331–358; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 16–17, pp. 660–661*).—From experiments with normal men the authors conclude that there is a marked difference in the effect of light and dark meat.

The lag in excretion of total nitrogen and creatin was practically the same, but there were noticeable differences in the uric acid excretion when dark meat was eaten. When light meat was taken the total endogenous uric acid was excreted within 2 or 3 days, while from 4 to 7 days were required in the case of red meat, the total amount of endogenous uric acid being the same in both cases.

Experiments were also made with gouty subjects.

Rôle of fats in the utilization of food albumin.—Mechanism of the therapeutic action of cod liver oil and medical fats in general, F. MAIGNON (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 24, pp. 1054–1056*).—These experiments with dogs and white rats were made to determine the rôle of fats in the utilization of protein food.

It was found that pure egg albumin was incapable of maintaining nitrogen equilibrium. Equilibrium was maintained when fat was added to the ration, but not when starch was added instead of fat. A single protein combined with fat was found sufficient to maintain nitrogen equilibrium. The value of such fats as cod liver oil, according to the author, is in their power to improve the utilization of nitrogenous substances.

Carbohydrate metabolism, M. KLOTZ (*Arch. Expt. Path. u. Pharmakol., 67 (1912), No. 6, pp. 451–480; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 596, II, p. 575*).—Analyses of various flours are given, and so-called carbohydrate cures for diabetes are discussed in this summary of data.

Observations on the limit of assimilation of glucose administered through the walls of the stomach, G. B. ZANDA (*Arch. Ital. Biol., 57 (1912), No. 3, pp. 409–414*).—In these experiments, the object of which was to determine the quantity of glucose which could be assimilated without producing glycosuria, both dogs and rabbits were used as subjects. Rabbits were found to have glycosuria normally, even on a vegetable diet, without addition of glucose. Only 2 rabbits were used. The author concludes that rabbits are unsuitable in the study of assimilation of glucose.

From 6 to 12 gm. of glucose per kilogram of body weight did not produce glycosuria in an unspecified number of dogs. The conclusion reached is that even if it is possible to discover the limit of assimilation with dogs, the results are fallacious and difficult to attain.

The work of other experimenters is reviewed.

The amyloclastic property of saliva, C. L. EVANS (*Jour. Physiol., 44 (1912), No. 3, pp. 191–202, figs. 2; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 596, II, p. 573*).—A method for determining the amyloclastic power of the saliva through the estimation of maltose is given.

The reaction is linear at first when the ratio of starch to enzym is large, dextrose formed by hydrolysis not then complicating the reaction. The maximum effect is obtained with a 3 per cent starch solution, the salivary amylase, ptyalin, being at 46°.

Osmotic equilibration in the living body, J. L. JONA (*Proc. Roy. Soc. Victoria, n. ser., 24 (1911), No. 2, pp. 230–254*).—The author reports determinations of the osmotic pressure of a large number of food materials, including among others commercial milk products, coffee infusion, tea infusin, soups of different sorts, dextrose solution, cane sugar solutions, lemon, orange, pineapple plum, tomato, apple, and other fruit juices coconut milk and saliva produced from sucking confectionery. The results of a study of the comparative cryoscopy of the blood of mammals, crustacea, etc., are also reported.

For the osmotic pressure determinations the Beckmann freezing point method was employed. "A mixture of ice and salt water was used to produce the

requisite cold, but care was taken to prevent excessive supercooling. In none of the recorded readings was the degree of supercooling more than about 1.5° C. Crystallization was started by inoculation with a fragment of frozen distilled water. The stirring was carried out by a simple clockwork mechanism."

On the basis of the experimental data and general material the author discusses the evolution of animal types and the relation of the questions considered to nutrition and to dietetics. The quotations which follow have to do particularly with dietetics:

"It is generally admitted that one of the functions of the stomach is the establishment of osmotic equilibrium between the fluid food swallowed and the blood. This it does by adding salts, etc., to hypotonic fluids, and by diluting the hypertonic. In the latter function the action of the stomach is aided by the salivary glands, which pour out a copious secretion of saliva. . . .

"This function is no doubt protective, for the deleterious effects of exposing tissue cells to the action of hypertonic or hypotonic fluids are well known. The swelling up of, and interference with sensation in, and the function of the skin after prolonged immersion in water, and on the other hand the 'roughness' produced when a piece of confectionery is retained for a few minutes between the teeth and cheek, are common examples. . . .

"Of all the fluid foods admitted to the stomach of man, alcoholic beverages and fruit juices alone are hypertonic. In fact most of the fluid foods admitted to the stomach are hypotonic, thus containing a water excess which the organism readily avails itself of for purposes of 'flushing out' the system, and which also allows of the addition of hydrochloric acid in the stomach. Moreover, it may be safely stated that in no case is a fluid admitted in which the hypertonicity is due to the mineral ingredients alone, except under protest.

"The sense of taste stands at the entrance to our alimentary canal, and tests th food not only qualitatively but also quantitatively from the standpoint of molecular concentration. . . .

"When for any reason a highly hypertonic fluid is admitted to the stomach, then vomiting (or sometimes diarrhea) is the result. This is well seen after the ingestion of strong salt solutions, large quantities of sweetmeats, or strong peptones, or overindulgence in alcoholic or saccharin beverages. In the process of mastication and swallowing, the salivary glands are stimulated to the pouring out of a copious secretion, and the organism has developed here, too, another mechanism to aid in the dilution of the stomach contents—namely, the sense of thirst, the proper satisfaction of which, by the ingestion of a sufficient quantity of water, tends to the dilution and consequent lowering of the osmotic pressure of stomach contents. If these protective mechanisms fail in carrying out their object, then the organism responds by rejecting the contents of the stomach altogether by the reflex mechanism of vomiting.

"Thus in man, at any rate, and undoubtedly in the case of the other mammals, the maintenance of a constant osmotic pressure of the blood by means of the kidneys and excretory organs is in a remarkable manner and to a considerable degree aided by the possession of these higher animals of the senses of taste and thirst."

Gaseous exchange at extreme external temperatures in relation to body surface area, H. Murschhauser (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 5, pp. 301–326; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, II, p. 776*).—From 46 to 131 per cent more carbon dioxid was produced and from 36 to 91 per cent more oxygen was consumed at 5° C. than at 35° in experiments with dogs, the smallest animals showing the greatest increase.

The metabolism is a direct function of the body surface area at medium temperatures, and even at extreme temperatures if the body temperature remains constant.

The effect of long-continued and pronounced overfeeding upon the intensity of energy metabolism in the animal body, and a study of overfeeding, E. GRAFE and R. KOCH (*Deut. Arch. Klin. Med., 106 (1912), No. 5–6, pp. 564–591; abs. in Zenthl. Biochem. u. Biophys., 13 (1912), No. 16–17, p. 659*).—Experiments covering several weeks were made with 2 persons and total metabolism was studied.

An increase in the oxidation of material in the body of as much as 100 calories was noted. In 6 weeks there was a gain of 50 per cent of weight while the oxidation processes in the body, as shown by 10-hour respiration experiments made while fasting, increased 80 per cent. The increased heat production was calculated to be from 7.5 to 32 per cent of the energy content of the food.

This is apparently a kind of secondary specific dynamic increase such as has been noted previously in experiments with dogs on a very abundant protein diet. One could also consider it as "luxus consumption."

ANIMAL PRODUCTION.

Comparative efficiency for growth of the total nitrogen from alfalfa hay and corn grain, E. B. HART, G. C. HUMPHREY, and F. B. MORRISON (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 133–153*).—A study of the retention of nitrogen by growing heifers with 2 rations, one consisting of corn meal, gluten feed, and corn stover; the other of alfalfa hay, corn starch, and a very small amount of corn stover. These rations were used in order to contrast a ration low in amid nitrogen, like a corn ration, with one containing a large percentage of amid nitrogen, as in the alfalfa ration.

One grade Holstein heifer was fed on each ration for from 6 to 8 weeks and the rations then reversed. One animal stored 451.7 gm. of nitrogen during the corn period and 754.2 gm. in the alfalfa period. The other animal stored 369.4 gm. in the corn period and 368.6 gm. in the alfalfa period. This experiment was repeated and the corn stover left out of the alfalfa ration. One animal stored 615.6 gm. of nitrogen in the corn period, and 592.2 gm. in the alfalfa period. The other stored 879.3 gm. in the corn period, and 822.8 gm. in the alfalfa period.

With both animals in the last experiment there was a slow decrease in the rate of nitrogen retention as the periods progressed. When the rations were suddenly changed there was in both cases an increase in the rate of nitrogen retention for a 2-week period and then a decrease.

The following conclusions were drawn:

"On the basis of total nitrogen ingested, the utilization of nitrogen for growth was as efficient when the source was from alfalfa hay as when it came from the corn kernel. With high intake of total digestible crude protein, which in the case of alfalfa includes the 'amid nitrogen,' the storage of nitrogen was essentially alike on the 2 rations. There was no sudden decrease or increase in the nitrogen content of the urine or feces when the animals were suddenly changed from one ration to the other. This is evidence that the 'amid nitrogen' was being used in the same way as the true protein nitrogen.

"It is apparent from our data that full value, at least for growth, can be given to the total nitrogen of alfalfa hay. The 'amid nitrogen' should not be considered worthless. The influence on milk production will be studied later. With growing heifers there was no very concordant rise in creatinin output

with increased storage of nitrogen. This precludes the possibility of using this index for these animals as a measure of the efficiency of a given source of nitrogen to produce nitrogen storage."

Primer on feeding stuffs, M. HOFFMANN (*Flugschr. Deut. Landw. Gesell., 1912, No. 12, pp. VIII+118, pls. 2, fig. 1*).—This is an introduction to a study of animal nutrition, based on the latest researches.

A method of estimating the money value of feeding stuffs, A. MORGEN (*Deut. Landw. Presse, 39 (1912), No. 5, p. 41; Fühling's Landw. Ztg., 61 (1912), No. 15, pp. 497–504*).—These articles discuss the starch value, fat production value, nutritive value of amids, and the money value of nutrients in feeding stuffs. In the opinion of the author the starch value, though not ideal, is the best term yet suggested to express nutritive value in a comparison of feeding stuffs.

Molasses, feeding lime, and salt, M. HOFFMANN (*Flugschr. Deut. Landw. Gesell., 1911, No. 10, pp. 32*).—A discussion of the value of molasses, feeding lime, and salt in rations for animals.

The use of the by-products of the olive for feeding live stock, G. BRIGANTI (*Bol. Quind. Soc. Agr. Ital., 17 (1912), Nos. 16, pp. 479–485; 17, pp. 517–526*).—This article reports chemical analyses and discusses the nutritive values of the leaves and twigs of the olive tree and the residue of the olive press.

Feeding experiments with ground vine trimmings, O. VON CZADEK (*Ztschr. Landw. Versuchsw. Österr., 14 (1911), No. 9, pp. 1104–1122; abs. in Zentbl. Agr. Chem., 41 (1912), No. 6, pp. 415–421*).—One-year-old twigs of the vines when finely ground were found on the whole to be about equal to straw as a feed for horses, steers, and cows.

Inspection of commercial feed stuffs, P. H. SMITH, G. R. PIERCE, and R. W. RUPRECHT (*Massachusetts Sta. Bul. 142, pp. 48*).—This bulletin contains the text of the new state feeding stuffs law, an article on low-grade by-products, a tabulated list of the wholesale cost of feeding stuffs for the year, and other matters relating to feed inspection. Analyses are reported of cotton-seed meal, linseed meal, gluten meal, gluten feed, dried distillers' grains, malt sprouts, dried brewers' grains, corn meal, ground oats, rye meal, hominy meal, provender, dried beet pulp, meat scrap, bone meal, alfalfa meal, by-products of wheat and rye, and mixed feeds.

Analyses of feeding stuffs, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1911, Apr., pp. 3–20*).—This contains analyses of feeding stuffs collected and analyzed in accordance with the state feeding-stuffs law. Analyses are reported of animal meal, beef scrap, tankage, cotton-seed meal, linseed meal, gluten feed, malt sprouts, dried brewers' grains, wheat middlings, wheat bran, provender, hominy meal, molasses feed, crushed oats, dried beet pulp, corn meal, alfalfa meal, and mixed feeds.

Commercial feed stuffs (*Dept. Agr., Com. and Indus. [S. C.], Bul. 26, 1912, pp. 199, pl. 1, figs. 4*).—Data are summarized regarding inspection of corn meal, grits, and other feeding stuffs during the years 1910 and 1911, including analyses of cotton-seed meal, wheat bran, middlings, shorts, ship stuff, rice meal, rice bran, hominy meal, cracked corn, alfalfa meal, alfalfa hay, dried beet pulp, distillers' dried grains, meat scrap, beef scrap, malt sprouts, poultry and mixed feeds, corn, and oats.

Dairying, poultry, and stock raising in Washington, H. F. GILES (*Olympia, Wash.: Bur. Statis. and Immigr., 1912, pp. 95, pls. 2, figs. 23*).—This contains statistical and other data relating to live-stock production in the State of Washington.

Breeding of cattle in Tahiti, H. COURTET (*Bul. Soc. Nat. Acclim. France, 59 (1912), Nos. 15, pp. 470–477; 16, pp. 503–506*).—This contains the history of the

introduction of cattle and other types of live stock into Tahiti, and statistical data, and methods of management. The principal forage crops grown are *Cynodon dactylon*, *Panicum altissimum*, *P. maximum*, *P. molle*, sugar cane, and sweet potatoes.

Feeding beef cattle in South Carolina, A. SMITH (*South Carolina Sta. Bul. 169, pp. 3–16, figs. 3*).—This bulletin reports a feeding test, the object of which was to determine the relative value of cotton-seed hulls, corn stover, and corn silage as roughage for beef cattle when fed with cotton-seed meal.

Sixty North Carolina steers averaging 890 lbs. were divided into 3 lots and fed 102 days in open sheds. Each lot received the same amount of cotton-seed meal, which was at the beginning ½ lb. per 100 lbs. live weight, and increased to 5 lbs. per steer daily at the end of the second week, and gradually to 7 lbs. for the second month, and to 8 lbs. for the last 40 days. In addition lot 1 was fed from 35 to 45 lbs. corn silage per steer daily, lot 2 cotton-seed hulls equal in weight to the meal fed and from 15 to 20 lbs. corn stover, and lot 3 from 24 to 26 lbs. cotton-seed hulls. The cattle were purchased at 4½ cts. per pound in North Carolina and were sold at the college for 5½ cts. per pound and shipped to Baltimore. The following table gives some of the results obtained:

Feeding tests with 60 steers for 102 days.

Kind of feed.	Daily gain per steer.	Cotton-seed meal per pound gain.	Cost per pound gain.	Profit per steer.	Loss per steer in shipping.
	Pounds.	*Pounds.*	*Cents.*		*Pounds.*
Cotton-seed meal and corn silage (1:5)	2.18	3.22	6.40	$7.26	60
Cotton-seed meal, cotton-seed hulls, and corn stover (1:1:2½)	1.54	4.57	9.82	2.51	70
Cotton-seed meal and cotton-seed hulls (1:3½)	1.50	4.69	11.90	0.01	67

In figuring profits cotton-seed meal was charged at $24, cotton-seed hulls $7, corn stover $5, and corn silage $2 per ton. Analyses of the manure obtained from these steers show a manurial value of $3.42 per ton, ammonia being valued at 16 cts., phosphoric acid 4 cts., and potash 4½ cts. per pound.

Silage for steers, W. A. COCHEL (*Pennsylvania Sta. Bul. 118, pp. 3–20, figs. 8*).—Continuing previous work (E. S. R., 28, p. 169), ear corn, cotton-seed meal, and corn silage fed to 12 steers produced in 126 days an average gain per head and day of 1.86 lbs., at a cost of 11.36 cts. per pound. Another lot fed in a similar manner, but which received no ear corn in the first 2 months, made an average daily gain per head of 1.85 lbs., at a cost of 9.02 cts. per pound. "As the gains made by each lot were almost identical, it may be said that 1,772.4 lbs. of corn silage replaced 792.92 lbs. of ear corn, or a ton of silage would replace 894.6 lbs. of ear corn, which at 70 cts. per bushel would give the silage a replacement value of $8.94 when substituted for ear corn under conditions prevailing in this test."

In estimating the cost no credit was given to the manure or pork produced. If a gain of 2 lbs. in pork is allowed for each bushel of ear corn fed to the cattle, it would increase the profit in the first lot by $47.84, and in the second lot by $26.80. Allowing $1 per ton for sawdust, $8 a ton for straw, and $1.50 a ton for manure, there was an additional profit of $31.24 to that made in the direct feeding of steers in pork production.

In an experiment with wintering beef breeding cows, 10 pure-bred Shorthorn cows and 10 Angus cows made an average daily gain on cotton-seed meal and corn silage of 1.17 lbs. for 140 days, the cost of feed per cow being $16.13. The labor is estimated at $2 per head and the value of the manure at $6.63 per

head, making a net cost for wintering of $8.22 per cow. From this experiment it is thought that wintering cows would solve the problem of securing feeding cattle at less cost than they could be produced on central markets, eliminate the loss in transit, and secure a better price than the present system. It would also permit a uniform system of labor throughout the year and maintain the soil fertility at a minimum expense, besides a better utilization of all rough and broken land capable of producing grass.

Weights and measurements of cattle of the Grabnerhof Alpine farming school, Austria, P. SCHUPPLI (*Jahresber. Steirmärk. Landw. Landes-Lehranst., 1911, pp. 143–147; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1812–1816*).—The growth measurements of the different classes of the Murboden and Pinzgau breeds of cattle are presented in tabular form.

The Charollaise breed of cattle, T. MAYDRAKOFF (*Jour. Méd. Vét. et Zootech., 63 (1912), Oct., pp. 577–599, figs. 4*).—This gives the history, characteristics, crosses with other breeds, and probable future of this popular French breed.

[Swiss chard and buda kale as forage crops for sheep] (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 3, pp. 235–237, figs. 2*).—Swiss chard, or, as it is sometimes called, silver beet, was found to be a good substitute for roots and rape for sheep in New Zealand and is recommended where turnips and rape are subject to disease. One acre of the first crop, which was fed off in April, furnished feed for 244 sheep for 14 days. One acre of the first feeding of buda kale furnished feed for 216 sheep for 14 days, and for 214 sheep in the second feeding. It is stated that both crops can be fed from 3 to 5 times, whereas rape can be fed off only twice in that climate.

Some data on the inheritance of horns in sheep, T. R. ARKELL (*New Hampshire Sta. Bul. 160, pp. 3–35, tables 7, figs. 43*).—This contains a review of evidence of other investigators on this topic and a continuation of experimental work, previously noted (E. S. R., 25, p. 373).

In studying inheritance in horns the common measure adopted in comparing size was the ratio of circumference to length. Horns measured every month from birth showed that they reached maturity at about 18 months of age. Tables are given which summarize the various matings that were made, their hypothetical somatic and gametic composition as to horns, and other data.

"At 3 months of age the rams possessed on an average a ratio (length divided by circumference) of in round figures 2, the ewes 1.6; at 6 months the rams 2.6, the ewes 2; at 1 year the rams 3.25, the ewes 2.5; and at 18 months the rams 3.4, and the ewes 2.7. The average ratio of a matured horn, according to our measurements of 48 Dorset Horn rams and ewes, was for the ram 3.44 and for the ewe 2.72. . . . Where reciprocal crosses were made of a long-horned sheep (Dorset Horn) with a hornless sheep (Down), the females were invariably polled and the males always possessed some indications of horn growth, varying all the way from minute scurs to a medium-sized horn. The longest horn from such a cross had a ratio of 2.86, and the shortest consisted of a scur with a ratio of 0.32. . . . Matings between hornless sheep invariably produce hornless females, and males that are either hornless or possess intermediate (simplex) horns. The hornless females may be pure or simplex, which selective breeding alone will show, unless their lineage for several generations is known. The hornless males can not reproduce a horn." . . . The knob condition which seemed to be present only in Merino sheep was found to exist in some cases, without producing a scur or horn, through successive generations. It is thought that the knob represents the duplex condition of the Merino horn, as records show that when crosses with other breeds were made the knob disappeared, the F_1 female offspring possessing either an entire absence or a long horn, ac-

cording to the nature of the mating. When a ewe bearing the knob character was crossed with a long-horn ram other than a Merino, the offspring of both ram and ewe possessed a long horn. The length of the horns of the F_1 offspring, though the ratio of length to circumference was somewhat less than that of the long horns of the Dorsets, clearly entitles their inclusion in the long-horn class.

"This patently proves that the Merino bearing a knob must possess two horn determiners in her germ plasm; otherwise, we should have some hornless females and males with simplex horns. It further proves that the potent horn determiner of the Dorset is not offset by the weakness of the Merino determiner, but rather strengthens it, for the two together are capable of producing a heavy horn, almost as large as the pure Dorset horn. The offspring from matings between a hornless ram and a ewe bearing knobs are in every respect similar to those of a hornless and a long horned sheep; the females show an entire absence of horn growth and the males bear the usual simplex condition of horns. A peculiar feature of the simplex horn . . . in the offspring arising from Merino crosses comprehends a striking irregularity in size between the right and left horns of many individuals. . . .

"The wide variation of the simplex horns in the different males is worthy of notice. Apparently the horn determiners and inhibitors do not always exist in equal degrees of strength. The inhibitor at times may so predominate over the single determiner as to reduce somatic appearance of horn growth to a considerable extent." A wide variation was found in simplex horns in Southdown-Dorset crosses. With the exception of the Merino crosses no extracted females possessed the slightest vestige of horn other than a perfect long one, which shows how completely the single horn determiner is held in abeyance by the double inhibitor.

"In the F_2 individuals obtained from Merino crosses with hornless sheep a reappearance of long horns in the rams occurs, although the ratios of these horns are somewhat less than the average for the horns of Dorsets. The ewes either bear knobs, scabs, or are hornless. The striking dissimilarity between the lengths of the right and left horns of Merinos, especially simplex, is also shown."

Wool pulling, R. DANTZER (*Sci. Amer. Sup., 74 (1912), No. 1906, pp. 26, 27, figs. 2*).—This describes the process of separating the wool from the hides of sheep which have been slaughtered.

Wool and manufactures of wool (*Washington: U. S. Tariff Board, 1912, pp. 1222+58, pls. 19, fig. 1*).—This is the report of the Tariff Board and contains a large amount of statistical data and general information on the value and amounts of imports and exports of wool and woolen goods, cost data on wool production and manufacture of woolen goods, and on the sheep industry in the United States and foreign countries, where sheep are kept in large numbers.

Camel management in East Africa, C. A. NEAVE (*Agr. Jour. Brit. East Africa, 4 (1912), No. 2, pp. 83–86*).—This discusses selection, care, and management.

Feeding experiments with swine (*Jahresber. Landw. Vers. Stat. Harleshausen, 1911–12, pp. 7, 8*).—With potatoes, barley, wheat bran, and meat meal a basal ration of apple pomace was a cheaper supplement for swine than corn meal. No advantage was gained by adding sweet mash from a brewery to a ration of rice meal, meat meal, and peas, or to one of barley, rye, and malt.

Probable error in pig feeding trials, G. W. ROBINSON and E. T. HALNAN (*Jour. Agr. Sci., 5 (1912), No. 1, pp. 48–51*).—The probable error was found to be much greater in young animals than in old, and in a short period than in a

long period. In order to avoid large errors there should be uniformity in breed, but not necessarily in weight.

A table is presented showing the number of animals that ought to be used in each experiment to show varying differences. For example, according to this table 15 animals must be taken in each lot where the 2 methods of feeding are expected to show a 10 per cent difference, and 54 animals to show a 5 per cent difference.

On the creatin metabolism of the growing pig, E. V. McCollum and H. Steenbock (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 209–218*).—Moderate fasting did not lead to creatin elimination in the pig, which indicated but little endogenous nitrogen katabolism. Subsequent tests on different diets led to the conclusion that it is not the plane of protein intake but the character of the protein in the diet which determines creatin production, and therefore that creatin may come from exogenous as well as endogenous protein metabolism.

Apparatus for the collection of urine and feces from mares, A. Scheunert (*Ztschr. Biol. Tech. u. Methodik, 2 (1912), No. 7, pp. 284–290, figs. 4*).—The methods and apparatus employed by the author in metabolism experiments are illustrated and described.

Equitation and the horse, E. Molier (*L'Equitation et le Cheval. Paris, 1911, pp. XXIII+430, figs. 64, pls. 50*).—This is a treatise on equitation and horse training, together with notes on the origin, description, characteristics, vices, physical defects, common ailments, and care of horses.

Distribution of licensed stallions in the counties of Wisconsin during 1912, A. S. Alexander (*Wisconsin Sta. Circ. Inform. 40, pp. 98*).—This contains the text of some state laws relating to breeding animals; data on organizing county horse breeders' clubs; number, class, and distribution of licensed stallions by counties; and other matters relating to the licensing of stallions. A further decrease in percentage of grade and scrub stallions and other good effects of the stallion law are reported.

Breeding and exportation of horses in Austria-Hungary in 1911 (*Mitt. K. K. Ackerb. Min. Pferdez. Angelegenht., 1912, No. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, p. 1598*).—This contains statistical and other data in regard to the breeding and exportation of horses.

The fossil horses of South America, I. Sefve (*K. Svenska Vetensk. Akad. Handl., 48 (1912), No. 6, pp. 185, pls. 3, figs. 32*).—This contains measurements and detailed descriptions of extinct types of horses of South America. A bibliography of other works on the subject is appended.

The zebra, A. Griffini (*Le Zebre. Milan, 1913, pp. XXVII+298; abs. in Amer. Jour. Sci., 4. ser., 34 (1912), No. 203, p. 492*).—This book treats of all known species, varieties, and hybrids of the zebra.

Synthesis of lecithin in the hen and the character of the lecithins produced, E. V. McCollum, J. G. Halpin, and A. H. Drescher (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 219–224*).—Hens were fed on a ration of skim milk powder and polished rice. The latter was extracted with boiling alcohol so that it was practically free from fat and lecithin.

A mixed sample of yolks laid by the hens was found to contain 3 per cent lecithin and 6.39 per cent kephalin. In the eggs laid between January 30 and April 15, each hen deposited in the egg yolks produced by her 27.65 gm. of phosphorized fats. During the feeding period the fat intake per hen from the skim milk powder was 17.37 gm., and being ordinary milk fat it was not suitable for direct deposition in the eggs. "It is evident, therefore, that the synthesis of phosphatids is readily accomplished in the body of the hen when the ration is free from these substances."

Remarkable record of a Leghorn hen (*New England Homestead, 65 (1912), No. 18, p. 5, figs. 4*).—A single comb white Leghorn hen, weighing 3.2 lbs., laid in 1 year 257 eggs weighing on an average 1.8 oz. each. The eggs sold for $7.43 and the hen ate 110 lbs. of feed, costing $1.66. The second year 200 eggs were laid.

Methods of killing poultry, MAY (*Ztschr. Fleisch u. Milchhyg., 23 (1912), No. 3, pp. 58–63*).—Different methods are described and a method of stunning before bleeding is recommended.

The beginner in poultry, C. S. VALENTINE (*New York, 1912, pp. X+450, pls. 2, figs. 130*).—A practical work, dealing with all phases of the poultry industry.

The Spanish poultry industry, E. T. BROWN (*Farm Poultry, 23 (1912), No. 11, p. 251, figs. 2*).—An account of the poultry industry in Spain, which is said to be in a backward condition. The principal breeds besides the Minorca, Andalusian, and Black Spanish are the Castilian, Barbezieux, and Prat. Brief descriptions of each are given.

The wholesale egg trade of Berlin (*Deut. Landw. Geflügel Ztg., 15 (1912), Nos. 32, pp. 453–455; 33, pp. 469–471; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1602, 1603*).—This contains data on the amount, price, source, and methods of marketing eggs in Berlin.

Notes on inheritance of color and other characters in pigeons, L. DONCASTER (*Jour. Genetics, 2 (1912), No. 2, pp. 89–98*).—This reports data on inheritance of color, leg feathers, tail feathers, and oil glands. The varieties of pigeons used were blue and red Tumblers, red Homers, and red and black Fantails.

Second report on the inheritance of color in pigeons, R. STAPLES-BROWNE (*Jour. Genetics, 2 (1912), No. 2, pp. 131–162, pl 1*).—Experiments thus far indicate that in pigeons silver and possibly also dun are further instances of sex-limited inheritance. A black male mated to a silver female resulted in all black offspring. A reciprocal cross gave both blacks and duns. A preliminary account is also given regarding other colors.

The first report has been previously noted (E. S. R., 21, p. 171).

Results of hybridizing ring doves, including sex-linked inheritance, R. M. STRONG (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 23 (1912), No. 5, pp. 293–320, figs. 3*).—This reports data on color inheritance, period of incubation, and other points on the breeding habits of ring doves.

Hybrids between blond male ring doves and white female ring doves are all blonds and mostly males. With reciprocal crosses the offspring are about equally blonds or whites, but all of the white birds are females, while most of the blond birds were males. Male white birds appeared when white hybrid females were crossed back on white stock males. The nestling hybrids were identical in appearance with nestlings of corresponding blond and white uncrossed ring doves. No evidence was obtained in support of the idea that the first egg laid by doves produces a male.

"Sex-linked inheritance in birds and elsewhere also can be explained, in my judgment, more logically with the assumption that the male is heterozygous for sex and the female homozygous, than by the contrary hypothesis. The appearance of recessive characters in F_1 when the male parent is recessive may be explained with the assumption that the female determining gametes of the male parent may either possess or lack something which is responsible for the absence in female offspring of dominant characters carried by the female parent."

Experiments with ostriches: Feather irregularities, J. E. DUERDEN (*Agr. Jour. Union So. Africa, 4 (1912), No. 2, pp. 186–200, figs. 11*).—A continuation

of earlier work (E. S. R., 27, p. 472). The present article discusses irregularities due to injury to the feather germ, double and treble feathers, vertical bars, irregularities in length of plumules, fusion of plumules, the absence of pigment, white bands, and albinism in ostriches.

A hen ostrich with plumage of a cock, F. W. FITZSIMONS (*Agr. Jour. Union So. Africa, 4 (1912), No. 3, pp. 380, 381, fig. 1*).—After the ovaries were removed from 3 hen ostriches 4 years of age they began to assume the black body plumage of the adult cock bird. The wing and tail feathers also became so changed as to become indistinguishable from those of the male.

Biology, animal breeding, and history of breeds, H. KRAEMER (*Aus Biologie, Tierzucht und Rassengeschichte. Gesammelte Vorträge und Aufsätze. Stuttgart, 1912, vol. 1, pp. VII+351, figs. 36; abs. in Fühling's Landw. Ztg., 61 (1912), No. 11, pp. 394, 395; Zentbl. Zool. Allg. u. Expt. Biol., 1 (1912), No. 8–9, pp. 306, 307*).—This consists of lectures and scientific papers on subjects connected with animal breeding. Among the titles of special interest are the following: Darwinism and Animal Production; Lamarckism and Animal Breeding; Mutation; History of Breeds of Domesticated Animals and their Significance in Practical Breeding; The Significance of Slaughter Tests in Anatomical Investigations in Animal Breeding; Pasturing, Conformation, and Milk Production; The Relation of Body Weight to Feeding Value of Cattle; Early Maturity in Horses; Measuring Horses; Breaking Strength of Bones; and several chapters on the ancestry of the horse.

Heredity and eugenics (*Chicago, 1912, pp. VII+315, figs. 98*).—This contains a course of lectures summarizing recent advances in knowledge in variation, heredity, and evolution and its relation to plant, animal, and human improvement and welfare by W. E. Castle, J. M. Coulter, C. B. Davenport, E. M. East, and W. L. Tower.

The Mendelian notation as a description of physiological facts, E. M. EAST (*Amer. Nat., 46 (1912), No. 551, pp. 633–655*).—This discusses the difference between Mendelian and other interpretations of inheritance.

The Mendelian notation extends to both qualitative and quantitative inheritance, and according to the author satisfies the facts of size inheritance. Galton's law gives the average somatic characters, whereas Mendel's law describes the breeding power of an individual. The correlation coefficient is not considered a measure of heredity, for the correlation between parental and filial population is merely a matter of averages.

Determination of sex in the animal kingdom, W. SCHLEIP (*Ergeb. u. Fortschr. Zool., 3 (1912), No. 3, pp. 165–328, figs. 22; abs. in Arch. Rassen u. Gesell. Biol., 9 (1912), No. 2, pp. 232, 233*).—A thorough review of investigations on the determination of sex. Suggestions are offered for further investigations in this field.

The thyroid gland of female sex organs, E. ENGELHORN (*Schilddrüse und Weibliche Geschlechts-Organe. Inaug. Diss., Univ. Erlangen, 1912, pp. 37, pls. 4; abs. in Zentbl. Expt. Med., 2 (1912), No. 1, pp. 25, 26*).—Investigations on guinea pigs, rabbits, and humans indicated that the functioning of the ovaries influenced the growth of the thyroid.

Contribution to the anatomy and histology of the third stomach of ruminants, G. REETZ (*Beiträge zur Anatomie und Histologie des dritten Magens der Wiederkäuer. Inaug. Diss., Univ. Leipsic, 1911, pp. 94, pls. 7; rev. in Ber. K. Tierarztl. Hochschule Dresden, n. ser., 6 (1911), pp. 53–56*).—The structure of the third stomach of cattle, sheep, and goats is described in detail. A bibliography is appended.

Investigations on the influence of exercise on the development and composition of internal organs, KÜLBS and F. M. BERBERICH (*Flugschr. Deut. Gesell. Zuchtungsk., 1910, No. 13; abs. in Jahrb. Wiss. u. Prakt. Tierzucht, 6 (1911), pp. 232, 233*).—Tests with dogs and swine showed that exercise increased the weight of the heart and liver and the size of the muscles and deepened the color of the bone marrow. Chemical analyses of these organs are also reported.

Contribution to the study of function of glandular cells and of the rôle of chondriosomes in secretion, H. HOVEN (*Arch. Zellforsch., 8 (1912), No. 4, pp. 555–611, pls. 2, figs. 13*).—A study of the cell structure in submaxillary, parotid, pancreatic, mammary, and other glands of many animals. The different structures found in the glandular cells, known as vegetative filaments, basal filaments, ergastoplasm, chondriosomes, etc., are thought to be different names for the same thing. They appear to be constant elements in the secretory cells, and perform an important rôle in all secretory glands.

A bibliography is appended.

The method of cell division in Moniezia, C. M. CHILD (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 21 (1911), No. 5, pp. 280–296, figs. 16*).—The author reports that the earliest cleavages in Moniezia are mitotic, and that direct division occurs often in germ as well as in somatic cells. He calls attention to the predominance of morphological hypotheses in cytology, which are based not on experimentation but on direct observation of fixed material, and points out that as long as the present method continues there will be endless discussion, since real progress can be made only when cytologists seriously undertake the physiology of the cell and cherished hypotheses are assigned to oblivion. It is pointed out that the theory of chromosome individuality is a wholly unnecessary hypothesis and is not in accord with the facts.

On the permanent life of tissues outside of the organism, A. CARREL (*Jour. Expt. Med., 15 (1912), No. 5, pp. 516–528, pls. 2*).—A continuation of earlier work (E. S. R. 24, p. 770). Improved methods of technique are described in the isolation and growing of tissues for a long period in vitro, for the purpose of studying the growth and viability of the animal cell.

Respiration apparatus of the Institute of Animal Physiology of the Royal Agricultural High School of Berlin, ZUNTZ (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 1, pp. 180–188*).—A brief description of the equipment for studying the income and outgo of energy in animals.

A cage suitable for metabolism experiments with rats and a description of the technique of feeding them, T. B. OSBORNE and L. B. MENDEL (*Ztschr. Biol. Tech. u. Methodik, 2 (1912), No. 7, pp. 313–318, figs. 5*).—The authors describe equipment and methods which they have found to be satisfactory.

DAIRY FARMING—DAIRYING.

Studies in dairy production, F. W. WOLL (*Wisconsin Sta. Research Bul. 26, pp. 55–135, figs. 2*).—In addition to those previously reported in Bulletin 226 (E. S. R., 28, p. 74) this publication contains a large amount of data on milk production, based on 398 complete yearly records secured in the Wisconsin Dairy Cow Competition in 1909–1911. Some of the results are summarized as follows:

"The total production of cows of the 3 breeds represented ranked in the following order: Holsteins, Guernseys, Jerseys. A consideration of the weights of the cows and the amounts of feed eaten (as measured both by the cost of the feed and by the Scandinavian feed unit system) show that the large cows within each breed were, as a general rule, heavy eaters and large producers; they yielded larger net returns and their dairy production was made more

economically so far as feed consumption is concerned than that of the small cows with a lower capacity for feed consumption and dairy production. Comparing the highest and the lowest producing cows in the competition we note that the former produced over 300 per cent more butter fat than the latter. Her feed cost 168 per cent more and she returned 675 per cent higher net returns than the lowest producer. Similar differences, although less pronounced, were found in a number of comparisons that were made between groups of cows of different productive capacity. . . .

"The amount of concentrates supplied in the rations of the high producers was 38 to 61 per cent higher than the amount in the rations of the low producers, and the total number of feed units in the ration of the former cows was 18 to 26 per cent in excess of the total feed units in the rations of the latter cows, the average data for 25 cows of the different breeds being considered in each case. . . . The largest production of milk solids for the year by a competition cow was 2,800.7 lbs., which was made by the cow holding the record for the largest yearly production of butter fat (888.2 lbs.).

"A study of the decrease in the production of the cows during successive months of the lactation period shows no noteworthy difference in this respect between the representatives of the different breeds. On the average for all cows giving milk 10 to 12 consecutive months, the percentage decrease in the production of milk per month was as follows: Second to seventh month, 5 per cent; eighth month, 10 per cent; ninth month, 13 per cent; tenth month, 20 per cent. Beyond the tenth month the monthly decrease in production may be taken to be the same as that for the tenth month for cows bred to produce a calf within a year from the date of last calving. The corresponding figures for the decrease in production of total solids and butter fat were slightly larger than for milk during the early part of the lactation period and slightly lower (1 or 2 per cent) toward the close of the period.

"The average monthly coefficient of variability in the daily milk yield for the same cows appears to be somewhat smaller than that for the percentage of fat in the milk from day to day; the error that may be introduced by calculating the monthly milk yield on basis of the yield during the 2-day official tests is therefore smaller than that incident to the present method of obtaining the average fat content of the milk for the respective months. It was found, on the average for all the data secured for Guernsey, Jersey, and Holstein cows, that the standard deviation for daily milk yield during the official monthly periods was 3.1 lbs., and the coefficient of variability 5.5 per cent. The corresponding figures for fat were 0.29 and 7.6 per cent. For cows kept under normal herd conditions, and not greatly crowded with feed, these figures are probably somewhat too high.

"The present method of obtaining yearly records of production by dairy cows is open to criticism, in so far as the milk yields credited to the cows are obtained from the owners' records. While the figures furnished are checked up by the respective secretaries of the dairy breed associations and are doubtless, in the large majority of cases, essentially correct, errors are at times introduced, either through a desire on part of the owner or the milker of getting the largest possible credit for production of the cows that can be obtained without detection, or through errors in weighing or reporting the weights of milk.

"The fact that minor errors in reporting milk yields can not be avoided under the present system of yearly testing, and the suspicion among some breeders that milk records are sometimes manipulated in the interest of the owner, tend to vitiate the value of the method of yearly testing now in vogue and no doubt keep some breeders from taking up this work, which is of the

greatest importance for the development of the dairy breeds and of the dairying industry. In order to overcome this criticism it is proposed to use the milk yields on the monthly official test days for the calculation of the yields of milk for the respective months, as now done in the case of the average fat content of the milk for each month. Direct comparisons that have been made show that the credits thus obtained for milk and fat production for the year agree very closely, as a rule within 2 per cent, with the actual yields obtained by weighing each milking.

"The change suggested in the method of securing yearly records of production for dairy cows would enable all farmers, whether they weigh the milk from their cows regularly or not, to obtain such records for their cows and to have them entered in the advanced registry of their breed association. It would make the agricultural colleges or other public institutions supervising the tests wholly responsible for the records made; in other words, it would make the records of the cows official, both as regards the production of milk and of butter fat.

"Awards of prizes for records of production by dairy cows may be made on the basis of the production of butter fat; or if cows producing milk of greatly varying fat contents are competing, the production of solids-not-fat, or of the amount of skim milk that would be obtained from the whole milk, should be considered, along with the production of butter fat. It is not practicable to consider the feed consumption of the cows in awarding prizes for dairy production, except under conditions where the amount of feed eaten may be accurately determined by disinterested parties."

[Dairy work at the McNeill substation], E. B. FERRIS (*Mississippi Sta. Bul. 158, pp. 4–7*).—Brief notes are given on the new dairy barn, silage making, forage crops, condition of the herd, and marketing dairy products.

Rape planted in September was estimated to be worth $10 per acre as a milk producer, but the second crop was inferior to the first. Velvet beans as a catch crop with corn were estimated to be worth $8 per acre.

The composition of milk, H. D. RICHMOND (*Analyst, 37 (1912), No. 436, pp. 298–302*).—An examination of 19,997 samples of milk analyzed in 1911 gave the following averages: Morning milk, specific gravity 1.0319, total solids 12.37, and fat 3.56 per cent; evening milk, specific gravity 1.0315, total solids 12.64, and fat 3.86 per cent. The average percentage of fat was slightly below that found in the previous year (E. S. R., 26, p. 80). A long drought during the summer months affected both the quantity and quality of the milk. It is usual to find that the solids-not-fat are lower in July, August, and September than during the other months, but during 1911 a greater deficiency than usual was observed, due mainly to a deficiency in protein.

Seasonal variations in composition of Cape Peninsula and Kimberley milk, C. F. JURITZ (*Agr. Jour. Union So. Africa, 4 (1912), No. 3, pp. 382–390, figs. 2*).—The average analysis of 4,755 samples of milk from the Cape division was as follows: Specific gravity 1.0311, fat 3.83, and solids-not-fat 8.67 per cent; and of 812 samples of Kimberley milk, specific gravity 1.0313, fat 4.43, and solids-not-fat 8.85 per cent. Seasonal variations of milk from different sections are reported in tabular form.

Both in the Kimberley and Cape Town milks the highest percentage in fat was just before the coldest, and the lowest in fat just before the warmest, part of the year, and in both places the minimum content of water corresponded to the coldest, and the maximum to the warmest, month.

The milk of some breeds of Indian buffaloes, A. A. MEGGITT and H. H. MANN (*Mem. Dept. Agr. India, Chem. Ser., 2 (1912), No. 4, pp. 195–258*).—This is a continuation of earlier work (E. S. R., 25, p. 778).

Analyses are reported of milk from a mixed herd of buffalo cows at the Poona civil dairy. The Surti breed predominated, other breeds represented being the Delhi, Deccani, and Jaffarabadi. The average percentage of fat in the morning milk ranged from 6.6 to 7.9, with an average of 7.1; the evening milk from 7.4 to 8.4, with an average of 7.9. The milk of the Surti breed was richer in fat than that of the others, being on an average 8.3 for morning milk and 8.5 per cent for evening milk. The percentage of solids-not-fat in the milk from the Surti buffaloes varied from 9.5 to 11.5 per cent in most of the samples. The average length of lactation of the Surti buffaloes was 53 weeks, with a range of from 32 to 67 weeks. The yield of milk from the buffalo during the lacation rose quickly to a maximum and remained constant for about two-fifths of the lactation period, after which there was a steady decline. There was no relationship between the composition of the milk and the period of lactation, except near the close of the lactation period. There was a great variation in the composition of the milk of individual animals of one breed and of the same animal at various times.

Bacteriological examination of market milk, P. G. Heinemann (*Cream. and Milk Plant Mo., 1 (1912), No. 2, pp. 12, 13*).—An abstract of a lecture delivered at the International Congress of Hygiene in 1912. The object of this work was to determine whether a reliable indicator of methods of producing milk could be found. The samples of milk were purchased on the market in the orginal packages.

"The average number of colonies per cubic centimeter in 108 samples of raw milk was 4,804,300, in 107 samples of pasteurized milk, 1,772,100. The percentage of acid colonies in raw milk was 31, and in pasteurized milk, 28. The average number of bacteria of the *Bacillus coli* group in 10 cc. raw milk was 14; in 10 cc. pasteurized milk, 19. The average number of aerobic spores in 10 cc. raw milk was 47; in 10 cc. pasteurized milk, 63. The average number of anaerobic spores in 10 cc. raw milk was 46; in 10 cc. pasturized milk, 61. The average number of milligrams dirt per liter of raw milk was 2.2; of pasteurized milk, 1.4. . . .

"Total counts seem to be the only means of judging methods of production and transportation. By this method it can not be distinguished definitely between methods of production and transportation. However, a large proportion of acid colonies, accompanied by a small amount of dirt, would indicate faulty transportation, and a small proportion of acid colonies and a large amount of dirt would indicate faulty production. When both production and transportation are faulty one may expect to find large total numbers, a large number of acid colonies, and a large amount of dirt. By making these 3 tests a fairly accurate insight into the quality of the milk may be obtained."

The bacterial content of the normal udder, F. C. Harrison and A. Savage (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 5 (1911), Sect. IV, pp. 31-40*).—The flora of the normal udder were found on the whole to consist chiefly of yellow and white cocci. *Micrococcus albidus* was found in 3 out of 5 virgin udders, and in 4 out of 7 mature udders. *M. varians* was found in 3 out of 5 virgin udders, and in 3 out of 7 mature udders.

"Aside from the teat and cistern the flora of the normal udder is a small one and consists of a few species of cocci. The flora of the teat and cistern is subject to change, which may be either practically continuous or slow. All organisms found in the lower part of the udder are unable to penetrate the upper and secreting regions. The flora of the foremilk is not necessarily any indication as to what germs are located within the gland. All bacteria with which the teat openings come in daily contact are unable to effect an entrance.

The lactic acid bacillus is occasionally present in normal udders. The cocci that characterize the middle milk and strippings come from an internal source."

On the varieties of Oospora (Oïdium) lactis in agricultural industries, E. SCHNELL (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 1–5, pp. 1–76, pls. 6*).—This is a study of the different varieties of *O. lactis* by means of morphological and physiological properties. Only one new species was found and is given the name of *O. casei*, because of its frequent appearance in casein. The results obtained from pure cultures in different media are presented in tabular form.

A new species of chromogenic bacteria found in milk (Bacterium chromoflavum), A. NARAY (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 11–13, pp. 222–233, figs. 7*).—The name of *B. chromoflavum* has been given to a species of nonmotile peptonizing bacterium, which produces a yellow color when grown on different media, and which was found in milk and cream. The rods are slightly bent and are variable in size. No spores have yet been found. A notable peculiarity is the serpentine-shaped colonies when grown on gelatin. The bacterium liquefies gelatin, is Gram negative, and does not plainly react to red or blue litmus, but is easily colored with anilin dyes.

The reciprocal action of some lactic acid bacteria during their development in milk, S. A. KOROLEFF (*Viestnik Bakt. Agron. Stantsii V. K. Ferrein, 1912, No. 19, pp. 20–50*).—The difference in behavior between *Bacterium bulgaricus* and *B. lactis acidi* in both pure and mixed cultures is pointed out.

Lactic acid and propionic acid bacteria in dairy products, A. WOLFF (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 18–22, pp. 494–540, figs. 18*).—This describes in detail the characteristics of certain types of bacteria found in many types of cheese and in many forms of soured milk sold in eastern Europe.

The most common form was *Bacterium lactis acidi*, usually occurring as a short rod, but sometimes assuming a streptococcal form. The propionic acid bacteria are also described, followed by a discussion of the part which they play in the ripening of cheese. There is a general summary of the literature on this topic.

The physiology of Bacterium lactis acidi, L. BUDINOV (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 8–9, pp. 177–187, figs. 4*).—This is a study of *B. lactis acidi* in pure cultures and in milk under natural conditions.

In both pure cultures and in milk *B. lactis acidi* increased rapidly in numbers up to 18 hours, then followed a rapid decrease. Acidity began to increase at the end of 6 hours, but the sugar disappeared faster than the increase in acidity. On keeping the fermented milk at 30° C. the bacteria were killed much quicker than at room temperatures and were nearly all destroyed in 15 days. When kept at 0° there was no appreciable decrease in number.

Milk and the public health, W. G. SAVAGE (*London, 1912, pp. XVIII+459, figs. 35*).—This book treats of milk in its relation to the general health of the community and is intended to be used as a guide for public health officials.

In part 1 summarized results are given of scientific investigations on the bacteriological contamination of milk in its relation to disease. In part 2 laboratory methods for the examination of milk are described. Part 3 treats of the administrative side of milk inspection.

A probable effect of control of milk supply upon infantile mortality from tuberculosis, S. DELÉPINE (*Jour. Compar. Path. and Ther., 25 (1912), No. 2, pp. 126–133*).—The author presents tabulated data showing that the quantity of tuberculous milk reaching the city of Manchester, England, has been reduced to nearly one-third of that of 14 years ago. At the same time infantile mortality, although still high, is very much decreased, which in part is attributed to the reduction of the amount of tuberculous milk.

Methods and standards for the production and distribution of "certified milk" (*Pub. Health and Mar. Hosp. Serv. U. S., Pub. Health Rpts., 27 (1912), No. 24, pp. 947–961*).—These recommendations were adopted at the annual meeting of the American Association of Medical Milk Commissions in 1912.

The Eichloff-Schümann method of milking, ZEEB (*Deut. Landw. Presse, 39 (1912), No. 43, p. 506, figs. 7; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, p. 1648*).—This describes a special form of milk pail and discusses methods of avoiding dirt.

The milk sediment test and its applications, A. C. BAER (*Wisconsin Sta. Circ. Inform. 41, pp. 17, figs. 12*).—This describes a method of making sediment tests (E. S. R., 23, p. 180), as well as its applications, with a comparison of open and small-top milk pails. Instructions are given showing the milk producer how to avoid sediment and also how to remove it by the separator.

The sterilization of milk by ultra-violet rays, C. HUYGE (*Ann. Sta. Agron. Gembloux, 1912, pp. 201–214*).—A résumé is given of researches on the effect of light rays on life and growth of microbes, with results of several tests on the sterilization of milk by ultra-violet rays.

In no case was complete sterilization obtained. It is stated that the sterilization of milk by this means presents great difficulties resulting from the presence in the liquid of colloids, which greatly impede the penetration of short-wave length light rays.

A bibliography of 61 titles on the abiotic action of ultra-violet rays is included.

Review of the Victorian dairying season and butter export trade, 1911–12, R. CROWE (*Jour. Dept. Agr. Victoria, 10 (1912), No. 6, pp. 375–384*).—This is a report on the condition of commerce in butter and of an investigation to test the efficiency of boric acid as a preservative for export butter.

The average points scored by all the butters containing boric acid was 90 and of the control samples 87.4. The average boric-acid content was 0.183 per cent. The butter containing preservatives sold at the higher price.

Important oleo decision (*N. Y. Produce Rev. and Amer. Cream., 34 (1912), No. 26, pp. 1061, 1064*).—A decision of importance to the dairy interests, made by the Appellate Division of the New York Supreme Court, is discussed. The decision reverses the lower court, and declares that the sale of oleo is illegal when it is colored in semblance to butter.

A study of the causes of variation in fat content of buttermilk, H. H. DOUGLAS (*Cream. Jour., 23 (1912), Nos. 10, pp. 1, 2; 11, pp. 1, 2, 23, 24; 12, pp. 1, 2, 4, 6; 13, pp. 1–3*).—The author reports several experiments in order to determine the loss of fat in butter making as measured by the percentage of fat in buttermilk.

In testing the percentage of fat in buttermilk with the Babcock test 21 cc. of acid added to 17 cc. of buttermilk gave fairly uniform results, but it was not possible to obtain so high a test of fat when the buttermilk was more than 1 day old as when fresh. Buttermilk from pasteurized cream contained 0.279 per cent of fat, as against 0.153 per cent in buttermilk from raw cream. There was practically no difference in the loss of fat from buttermilk churned straight through, or when part of it was churned and settled down and the remainder then added, nor was there any difference when sweet and sour cream were mixed. There was a greater loss with thick than with thin cream. At low temperatures there was no more loss in churning sweet cream than with the sour cream.

Report of the third Dominion Conference of Dairy Experts (*Rpt 3. Dominion Conf. Dairy Experts, 1911, pp. 119, pls. 2*).—Among the papers included in this report are the following: The Pasteurization of Cheese Factory Whey, by F. Herns; Testing Cream at Cream Gathering Creameries, by J. F.

Singleton; Accuracy of Cream Scales and Care of Composite Samples, by H. H. Dean; Legislation for the Proper Branding of Whey Butter, by G. G. Publow; The Manufacturing of Oleomargarin and Renovating Butter in Canada, by P. W. McLagan; Pasteurization of Cream, by J. D. Leclair; Methods of Paying Patrons at Cheese Factories, by H. H. Dean; and Grading and Quality Basis Payment of Cream at Creameries, by C. Marker.

Salt in creameries and cheese factories, F. M. BERBERICH (*Molk. Ztg. [Hildesheim], 26 (1912), No. 48, pp. 889–891*).—A discussion of the most desirable amount of salt and the effect of salt and mineral impurities on butter and cheese. The author reports analyses of several samples of commercial salt. Calcium sulphate was the most frequent and abundant impurity.

Data on the chemical composition of Emmental and Russian Schweizer cheese, L. BUDINOFF (*Viestnik. Bakt. Agron. Stantsii V. K. Ferrein, 1912, No. 19, pp. 199–220*).—Chemical studies of the process of ripening in the Emmental type of cheese made in Russia showed the process to be similar to that in Switzerland, except that proteolysis does not proceed so rapidly.

Comparative investigations on Parmesan and Lodi cheese, C. FINZI (*Staz. Sper. Agr. Ital., 44 (1911), No. 5–6, pp. 462–468; abs. in Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 4, pp. 287, 288*).—Lodi cheese contained less water and fat and more ash and protein than Parmesan cheese.

Concerning Liptau cheese, K. VON FODOR (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 12, pp. 662–668*).—Analyses are reported of Liptau or Brinsen cheese, made at different times of the year.

The average water content was 46.57 per cent in May, 45.09 per cent in June, 44.52 per cent in July, 46.69 per cent in August, and 50.13 per cent in September. The fat content for the same months was 26.84, 27.98, 28.19, 27.07, and 24.82 per cent, and the protein content 20.65, 21.43, 21.48, 20.76, and 20.15 per cent. Ash analyses and an analysis of cow pot cheese are also given.

Studies on the composition of Liptau cheese fat, K. VON FODOR (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 4, pp. 265–269*).—The index of refraction, Reichert-Meissl number, iodin number, and other chemical constants are reported.

Investigations on the presence and vitality of tubercle bacilli in cheese, W. KANKAANPÄÄ (*Untersuchungen über das Vorkommen und die Lebendauer der Tuberkelbazillen im Käse. Inaug. Diss., Univ. Leipsic, 1911, pp. 55*).—Tubercle bacilli were found to be present in Finnish cheese 200 days old. In cheese made from artificially infected milk bacilli were present in Bauern cheese 50 days old, in Kilo cheese 68 days old, in skim cheese 77 days old, in Edam cheese 103 days old, and in Swiss cheese 113 days old. As the length of the vitality varied with the type of cheese it is thought that the composition of the cheese is the controlling factor.

Concerning dried milk, F. HUEPPE (*Centbl. Bakt. [etc.], 1. Abt., Orig., 64 (1912), Festschrift F. Loeffler, pp. 34–44*).—The author reports chemical analyses and bacterial counts of several samples of dried milk.

Commercial yoghourt preparations, W. FREUND (*Molk. Ztg. [Hildesheim], 26 (1912), No. 78, pp. 1468–1470*).—The great variation in preparations of yoghourt is shown in this study of commercial samples of yoghourt, which reports percentages of fat and solids-not-fat, bacterial flora, and other data.

VETERINARY MEDICINE.

Yearly report in regard to the progress made in veterinary medicine, edited by W. ELLENBERGER ET AL. (*Jahresber. Vet. Med., 31 (1911), pp. IV+414*).—This is a review of the literature issued in 1911 or thereabouts, per-

taining to practically all branches of general and special veterinary science. In addition it deals with some of the aspects of dairying, breeding and feeding of animals, beekeeping, diseases of birds and fish, statistics, etc.

Use of the fermentation test in dairy inspection, L. A. KLEIN and H. C. CAMPBELL (*Amer. Vet. Rev., 42 (1912), No. 1, pp. 25–33*).—"In all of the 7 investigations reported, the fermentation test [modified Walters test] proved to be a correct criterion of the principal source of bacterial contamination and was of material assistance in discovering the cause. [The authors] are not unmindful of the fact that the cases were rather few in number and that it would be desirable to have a larger number, but are of the opinion that the results obtained indicate that the fermentation test is likely to prove of great value for the purpose mentioned."

A method for the removal of the toxic properties from cotton-seed meal.—A preliminary report, W. A. WITHERS and B. J. RAY (*Science, n. ser., 36 (1912), No. 914, pp. 31, 32*).—Having found that cotton-seed meal when extracted with gasoline, boiled on a water bath with alcohol for 2 hours, an aqueous solution of sodium hydroxid added in such an amount as to combine with the meal or add a slight excess, filtering while hot, washing with the hot alcohol, and drying the mass on the filter, was nontoxic for rabbits, the authors now request that other investigators working along the same line repeat the experiments for the purpose of thoroughly testing the value of the method.

The authors fed 14.6 gm. of the prepared meal, corresponding to 15 gm. of ordinary meal, daily to each of 6 rabbits averaging 1,992 gm. in weight, from March 18 to April 25, 1912. The rabbits were all in good condition, but lost upon an average 134 gm.

It is intended to utilize this process on a commercial scale for rendering cotton-seed meal nontoxic for domesticated animals.

Investigations into the protecting part played by paddy bran in feeding with white rice, L. BRÉAUDAT (*Jour. Pharm. et Chim., 7. ser., 4 (1911), No. 10, pp. 447–451; abs. in Internat Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, p. 221*).—When hens were fed on white rice exclusively, a green diarrhea resulted. No difference was noted in the case of raw or boiled rice. The diarrhea was accompanied by a loss of appetite, fall in temperature, emaciation, and general malaise, followed within 2 or 3 weeks by paralysis and death. At the outset the birds took from 200 to 500 gm. of rice per day, but after the above described conditions set in the consumption fell to 20 to 30 gm. per day. When rice bran or a water extract of the bran was fed with the rice none of the symptoms occurred.

The biological action of certain protein cleavage products when administered parentally, A. SCHITTENHELM and W. WEICHARDT (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 14 (1912), No. 6, pp. 609–636*).—This investigation indicates that proteins as such are relatively nontoxic. In the doses used in these experiments they had no effect on blood pressure and produced no special general symptoms. The conjugated proteins (globin, histon, protamin), in contrast to the simple proteins (casein, etc.) are toxic. They produce a marked fall in blood pressure, affect respiration, coagulation time of the blood, and the temperature, and in small doses produce death. This is also characteristic of the proteins obtained from the same species. This toxicity is not believed to be due to the presence of an excess of diamino acids because globin contains hardly more diamino acid than casein. In all probability it is dependent upon the total constitution of the protein.

The test confirms the findings of Schittenhelm and Weichardt in so far that it again brings out the fact that proteins can be rendered nontoxic in 2 ways,

i. e., by pairing with indifferent substances like nucleic acid or by cleavage into smaller molecules.

Intracellular ferments and chronic infections, D. P. GRINIEW (*Arch. Sci. Biol. [St. Petersb.], 17 (1912), No. 2, pp. 177–218*).—The organs (liver, spleen, kidney, and heart) and tissues (brain, muscle, and bone) of rabbits affected with chronic tuberculosis show a different enzymatic power than is present during health. Lipolysis is reduced while catalysis, amylolysis, and nucleolysis are increased in some organs and tissues and diminished in others. The tissues of tubercular rabbits contain a greater amount of water than those of normal animals.

Extraction of poison from the brain during anaphylactic shock, C. ACHARD and C. FLANDIN (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 24, pp. 1073–1075; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II. Ref., 6 (1912), No. 2, p. 441*).—The brain from a subject (guinea pig) affected with anaphylactic shock was extracted with alcohol, ether, and chloroform. In this way a substance was obtained which when injected into the normal guinea pig in a salt solution emulsion would produce typical anaphylaxis. No symptoms were produced when extracts from normal brains were injected. The poison seems to be bound to the lipoid substances of the brain.

A diluting fluid for standardization of vaccines with the hemocytometer, J. G. CALLISON (*Jour. Med. Research, 27 (1912), No. 2, pp. 225–227*).—The diluting fluid used has the following composition: Hydrochloric acid 2 cc.; mercuric chlorid, 1:500, 100 cc.; acid fuchsin, 1 per cent solution, enough to give the solution a deep cherry-red color. The procedure is then as follows: "A drop of the filtered solution is placed on the ruled stage of the hemocytometer, covered with a coverslip, and examined with a 4 mm. objective. The color should be just deep enough not to obscure the ruling. If the color is too deep, filter again, as each filtration removes some of the fuchsin. If not deep enough, add more fuchsin solution. Using the red dilution pipette, draw up the bacterial emulsion to the 0.5 or 1 mark, and the diluting fluid to the 101 mark. Shake vigorously for 3 minutes, allow 2 or 3 drops of fluid to run out of the pipette, then deposit a small drop on the stage of the hemocytometer. Cover with a polished glass coverslip and set aside half an hour for sedimentation to occur. Make the count with a small diaphragm and a strong light. Keep the small square being counted well in the center of the microscopic field. Before counting, focus up from the ruled lines to ascertain if all the bacteria have settled on the ruled stage. Make the count and the subsequent calculation as for red blood cells.

"The bichlorid forms a mercury albuminate on the surface of the bacteria and causes more rapid sedimentation; the hydrochloric acid keeps the whole in solution; and the acid fuchsin stains the bacteria, making them more visible."

Preliminary report on botanical investigations into gal-lamziekte, J. BURTT-DAVY (*Agr. Jour. Union So. Africa, 4 (1912), Nos. 1, pp. 57–62; 2, pp. 172–185; 3, pp. 453–455; 5, pp. 693–713, figs. 8*).—In reviewing the collected facts about lamziekte in the light of the several theories advanced, the author is led to the following conclusions: Lamziekte is due to a plant poison; this poison is developed in grasses or other plants which are normally innocuous; its development is favored by certain climatic and telluric conditions in which summer drought is an important factor; the conditions which produce wilting of the grass favor the production of the lamziekte toxin, which would account for the theory of the Bechuanas that the disease is due to wilted grass; this toxin is cumulative, i. e., it does not take effect until a certain quantity has been accumulated in the animal system (the requisite amount may, of course,

vary according to the age, size, or constitution of the animal); it is practically absent, or at any rate least injurious, on Karroo veld, sweet veld, and river veld; it is worst on sour sand veld and gebrokken or mixed veld; the removal of the coarser "sour" grasses by close grazing or mowing of the veld reduces the number of cases; preventive measures are likely to be found practicable, and these will probably include (a) the camping down of the farms and the frequent movement of stock from one camp to another, and (b) the preparation and feeding during the dry season of more foodstuffs, such as teff hay, maize hay, maize stover, and maize silage.

Immunization against hemorrhagic septicemia, J. R. Mohler and A. Eichhorn (*Amer. Jour. Vet. Med., 8 (1913), No. 1, pp. 14–19*).—After critically reviewing those diseases, collectively grouped under the name hemorrhagic septicemia and caused by an ovoid bacterium, *Bacillus bipolaris septicus*, a description of an outbreak of a fatal disease (barbone) among the buffaloes in the Yellowstone National Park in 1911 and the measures used in combating it are given.

From the cadavers of some of the animals *B. bipolaris bubalisepticus* was isolated. Test animals which were inoculated with the organism died of typical hemorrhagic septicemia. With a view of immunizing against the disease, vaccines were prepared from two varieties of hemorrhagic septicemia organisms. One of the strains represented the germ isolated from the buffalo disease in the Yellowstone National Park, while the other was a variety of hemorrhagic septicemia of cattle isolated from animals which died of the disease in Colorado. "The vaccines prepared from these two varieties were tested for their potency on laboratory animals and also on sheep, a comparison of the action of the two different vaccines being carefully made. . . . The vaccine for the first inoculation was prepared by growing the organism 5 days at 42.5° C., while the vaccine for the second injection was cultivated in the same temperature for only 2 days. For the preparation of vaccine Erlenmeyer flasks of peptone bouillon media were inoculated with the organism after it had been cultivated for several generations on agar, and the bouillon cultures were then placed under temperature conditions stated above. The straight attenuated culture after thorough shaking was used for vaccinations in some of the animals, while others received the same vaccine to which 0.5 per cent of carbolic acid had been added. This was undertaken in order to determine whether the preserved vaccine possesses the same immunizing qualities as the unpreserved material. . . . The virus isolated from the buffalo disease was especially virulent for rabbits." The virus from the cattle disease was less virulent.

After obtaining favorable results with the laboratory animals, all the animals in the buffalo herd were inoculated with 1 cc. of the vaccine prepared from the organism isolated from the buffalo at intervals of 10 days apart. "Following vaccination, the herd was carefully observed and no immediate effects were noticed from the vaccination, and up to the present time there has been no indication of the recurrence of the disease among the buffaloes."

In conjunction with the above experiments, tests were conducted with laboratory animals for the purpose of determining the value of the complement fixation reaction for diagnosing this disease. "The hemolytic system consisted of sensitized rabbit serum (amboceptor), guinea pig serum (complement), and washed sheep corpuscles. The test was employed with sheep serum and rabbit serum of artificially infected animals, and the results proved entirely satisfactory. . . . This reaction has been noted even 3 months after the vaccination, and the testing of the blood will be continued from time to time in

order to determine the length of the period in which the animals possess immune bodies subsequent to vaccination."

The complement fixation reaction is also considered of value for determining the relative immunity conferred by vaccination.

Cultivation of Spirochæta gallinarum, H. NOGUCHI (*Jour. Expt. Med., 16 (1912), No. 5, pp. 620–628, pl. 1*).—"*S. gallinarum* can be cultivated in suitable artificial media for many successive generations and probably for indefinite periods. The presence of fresh tissue and a certain amount of oxygen seems to be essential for its growth. No perceptible odor is produced in the cultures.

"The maximum growth of *S. gallinarum* is reached on about the fifth day, but the phase of degeneration commences slowly and gradually, so that in this respect the *gallinarum* differs from the *duttoni, kochi, obermeieri*, or *novyi*, whose cultures are characterized by sudden onset of degeneration soon after the maximum growth is attained. No rod formation resembling bacilli arises in the course of multiplication of *S. gallinarum* in cultures. Many round or oval bodies appear in old cultures, but no infection of animals or formation of spiral forms from these granules has been produced. The granules are probably the degeneration products derived from the periblast of the spirochætæ.

"Cultures of *S. gallinarum*, either old or young, do not contain a form which passes through a Berkefeld filter (V) that infects chickens or grows into spirochætæ. *S. gallinarum* remains virulent for chickens after being in cultures for at least 13 generations, but it may become a virulent under certain cultural conditions. The inoculation of chickens with the attenuated culture renders the birds refractory to the subsequent infection with a virulent strain. When the spirochætæ are cultivated in the media containing rabbit kidney instead of chicken muscle, the individual specimens are somewhat thicker, but otherwise typical. *S. gallinarum* multiplies in culture by transverse division. No positive evidence of a longitudinal division has been obtained."

Agglutination tests with trypanosomes, W. MATTES (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 6–7, pp. 538–573, figs. 8*).—In this work 5 pathogenic trypanosomes were used, namely, *Trypanosoma gambiense, T. brucci, T. equiperdum* (beschälseuche), *T. congolense*, and the form causing dourine (a disease which resembles beschälseuche).

Agglutination was shown to take place with trypanosomes and normal serum in dilutions up to 1:100. With immune serum the agglutinations took place up to 1:12,000. The sera from cured animals were found to agglutinate trypanosomes a long time after the symptoms had ceased to be present, but in all cases the titer was found to be markedly higher than in the agglutination produced with normal sera. Radio-active substances were found to increase the agglutination titer. The agglutination reaction was not species specific and must therefore be considered only a group reaction.

This article also discusses staining methods and the morphology of trypanosomes and includes a bibliography embracing 10 titles.

The changes in the biological characteristics of the tubercle bacillus produced within and without the body, E. A. LINDEMANN (*Berlin. Klin. Wchnschr., 49 (1912), No. 25, pp. 1185–1187; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 1, p. 398*).—It was shown that tubercle bacilli in general, when compared with other kinds of bacteria, are very constant in their biological characteristics. In a few instances a marked decrease in virulence was produced when the organism was cultivated for a long time on bouillon media. From cases of lupus in man, and from other cases of tuberculosis in man and bovines, organisms were cultivated which had a low degree of virulence. In one of the instances it was possible to raise the virulence by passing it through some of the offspring (rabbit) from tuberculous subjects.

Tubercle bacilli (Perlsucht) which were obtained from horses affected with tuberculosis were also reduced in virulence. The author was unable to prove that the human, bovine, or avian type of tubercle bacillus could be changed into another type.

On cell content of the blood in tuberculous cattle, rabbits, and guinea pigs, SCHOLZ (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 1–3, pp. 189–206; abs. in Rev. Bact., 2 (1912), No. 3, p. 67*).—"The author gives the results of cell counts of the blood from artificially infected tuberculous cattle, rabbits, and guinea pigs. The normal cell counts for healthy animals of the species were first worked out. He finds that there is an increase of white cells in animals which have been infected by means of tuberculous material, with an increased percentage of lymphocytes and eosinophil cells in the differential count. There is at the same time a diminution in the number of erythrocytes. At a later stage of infection the white cell count also is lowered. An increase in the white cell count and a diminution in the number of erythrocytes followed also on the injection of either human or bovine tuberculin."

In regard to the occurrence of tubercle bacilli in the blood stream of tuberculous subjects.—III, Elimination of the tubercle bacilli in the milk of tuberculous women, KURASHIGE, MAYEYAMA, and YAMADA (*Ztschr. Tuberkulose, 18 (1912), No. 5, pp. 433–445; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 12, p. 264*).—These observations included 20 tuberculous and 2 healthy women. In 85 per cent of the cases tubercle bacilli were discharged in the milk, and in all cases where the disease was in the second or third stage.

The dissolution of tubercle bacilli in the tubercular organism, R. KRAUS and G. HOFER (*Centbl. Bakt. [etc.], 1. Abt., Ref., 54 (1912), Beiheft, pp. 191–200*).—Subjects infected with tuberculosis produce bacteriolysins which are bacteriolytic for tubercle bacilli. The bacteriolysins can be easily detected in the serum obtained from these individuals. These tests were conducted with guinea pigs which were infected with a loopful of tubercle bacilli (avian, human, or bovine type) intraperitoneally.

Action of large doses of tubercle bacilli when injected under the skin of animals, F. MORELLI (*Arch. Méd. Expt. et Anat. Path. [Paris], 24 (1912), No. 5, pp. 633–646*).—The human type of bacillus was cultivated upon potatoes, the culture scraped off, washed with sterile water, emulsified with physiological salt solution, and sterilized for 20 minutes at 120° C. This emulsion was injected under the skin of rabbits which had been previously shaved and disinfected with tincture of iodin. After abscess formation took place the abscess was extirpated, made into a homogenous emulsion, and served as an antigen for the complement fixation test. The various biological reactions, i. e., precipitation, agglutination, opsonic index, and complement fixation were more pronounced after the abscess was removed than before, and the weight of the animal decreased rapidly after extirpating the abscess. The above results show that the removal of the abscess caused a loss in defensive powers on the part of the animal against the infection.

The gross and histological findings of the various abscesses are also described in the original.

Experiments with tuberculin, J. H. GAIN (*Nebraska Sta. Rpt. 1911, pp. 198–214, figs. 8*).—These experiments, which were made with 10 bovines, indicate that it is quite possible to nullify the tuberculin test by injecting an ordinary dose of tuberculin before the regular test is made. It was noted that an ordinary dose will show its influence even after a period of 30 days. If the previous dose of tuberculin is doubled a reaction will usually be obtained, but this is by no means constant.

It is also pointed out that an animal may give one or more positive reactions and months later will not react at all. This is typically shown in the case of an Angus bull weighing over a ton, of fine type, and during the whole period easily kept in good flesh. He was found tubercular early in 1908, he gave each year a typical reaction until October, 1910, when the rise in temperature was less than 2°. Thirty-seven days later with an injection of 4 cc. of tuberculin his temperature remained normal. Six months later he gave a reaction that would not have been considered positive. The rise to 103 at 4 p. m. would not have been discovered in the course of an ordinary test, as the four previous temperatures would have been considered sufficient. This case is interesting from the fact that there was evidently a considerable period when this animal would have passed a careful test as being perfectly free from tuberculosis.

All the animals used in the test were later slaughtered and found tuberculous, 3 being condemned as unfit for human food.

Notes on complement fixation in tuberculosis, A. T. LAIRD (*Jour. Med. Research, 27 (1912), No. 2, pp. 163–175*).—These tests, which were conducted with man, show that the complement fixation test is of comparatively little diagnostic value when employing an antigen prepared from the tubercle bacillus. A bibliography embracing 24 titles is appended.

Contribution to the specific therapy of tuberculosis, C. TITZE (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 30, pp. 541–543*).—After pointing out the fact that guinea pigs can not be infected as readily as pigs per mucous membrane of the alimentary canal, and furthermore that bovines showed varied degrees of resistance when infected either intravenously or subcutaneously, the author states that of all the specific methods thus far proposed for treating tuberculosis tuberculin has yielded the best results. The healing of a tuberculous process seems to depend very much upon the formation of new tissues, which makes the multiplication of the tubercle bacillus difficult.

Anaplasmosis of bovines in the Roman campagna, M. CARPANO (*Mod. Zooiatro, Parte Sci., 1912, No. 8, pp. 336–342, fig. 1*).—The author records the occurrence of *Anaplasma marginale* in bovines in the Roman campagna, where it is apparently transmitted by *Rhipicephalus bursa*.

Results with the complement fixation test in the diagnosis of contagious abortion of cattle, F. B. HADLEY and B. A. BEACH (*Amer. Vet. Rev., 42 (1912), No. 1, pp. 43–50*).—Previously noted from another source (E. S. R., 27, p. 582).

New light on the mystery of cornstalk disease, T. P. HASLAM (*Farmers Mail and Breeze, 42 (1912), No. 41, pp. 3, 17, fig. 1*).—The author states that an organism has been obtained from all the cases of cornstalk disease sent in, which, although differing in some respects, agrees in many characteristic with the causative organism of hemorrhagic septicemia of cattle (*Bacillus bovisepticus*).

Vaccination against foot-and-mouth disease in bovines, J. LECLERCQ and M. F. NICODÈME (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 16, pp. 363–368*).—The vaccine used in these experiments was the lymph drawn from the unbroken aphthae with a sterile syringe. The serum was attenuated with a titrated iodin-iodid solution. The rate at which the solution is decolorized by the vaccine is an index of the virulence of the vaccine. For use the vaccine is diluted with an iodized salt solution and injected into the submucosa of the buccal cavity.

It is estimated that the method with calves gives positive results in 90 per cent of the cases and with adults in 30 per cent.

Trypanosomes in beef cattle with enlarged spleens, P. KNUTH and C. BONGER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 44, p. 804*).—The authors

think it probable that the enlarged spleens observed in Potsdam by Klepp[a] in otherwise normal beef cattle were caused by latent trypanosome infection, since they have found trypanosomes in smears from the spleen, liver, and kidneys of such animals.

Vaccination against sheep pox, J. BRIDRÉ and A. BOQUET (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 5, pp. 366–368*).—The titer of this serum vaccine can be determined with the aid of the complement fixation test and compared with a specific serum, i. e., a constant serum versus varying amounts of virus. By comparing the data obtained with a standard vaccine the potency of the vaccine can be determined, and it can then be diluted or concentrated as necessary. A sensitized vaccine can be produced if the proper amount of antiserum is added.

Hog cholera and its control, M. R. POWERS (*South Carolina Sta. Bul. 168, pp. 31, figs. 10*).—This bulletin gives a brief general account of hog cholera, including the manufacture and use of antihog cholera serum.

Hog cholera serum work, with especial reference to disappointments, M. H. REYNOLDS (*Amer. Vet. Rev., 42 (1912), No. 1, pp. 15–24*).—The main reasons given for some of the disappointing results obtained with antihog cholera serum are as follows: Use of serum too late, when the herd has been allowed to become generally infected; faulty handling of the serum; allowing the serum to become contaminated with bacteria; use of poor untested serums; and the use of the serum by careless, incompetent persons. Some striking illustrations are presented, with a description of the procedure followed by the veterinary department of the University of Minnesota.

Swine plague serum, P. WÄLCHLI (*Schweiz. Arch. Tierheilk., 54 (1912), No. 1, p. 13; Berlin. Tierärztl. Wchnschr., 28 (1912), No. 31, p. 569*).—Hogs having swine plague were treated with an antiserum prepared in Switzerland. An improvement was noted in all cases after 3 days, and after 3 weeks the symptoms had vanished. No fatal cases occurred. The preparation is considered on a par with Suptol-burrow.

The roundworms of domestic swine, with special reference to two species parasitic in the stomach, W. D. FOSTER (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 158, pp. 47, pl. 1, figs. 28*).—The two species *Arduenna* (*Spiroptera*) *strongylina* and *Physocephalus sexalatus* of the family Filariidæ, here considered, are widely distributed and of frequent occurrence in American swine. *A. strongylina* is much more common in American swine than it is said to be in European swine. It has been found abundantly in the slaughterhouses at St. Louis, Chicago, South Omaha, and Kansas City, and has also been collected at Benning, D. C., and Bethesda, Md.

"Specimens of hogs' stomachs received from Chicago showed the worms deeply fastened in the submucosa or embedded in necrotic tissue near which were deep ulcers. The condition suggested infection with *Bacillus necrophorus*, the inoculation of which might easily result from the burrowing of the worms; however, owing to the sterile condition of the specimens received, this could not be satisfactorily demonstrated. A similar diseased condition of the stomachs of hogs in Europe is attributed by Von Rátz to infection with *A. strongylina*. Under the circumstances the worm should be regarded with grave suspicion, and general prophylactic measures for the prevention of the spread of infection are suggested."

The author finds that *P. sexalatus* is almost as widely distributed as *A. strongylina*, since out of 8 lots of specimens of the latter species, specimens of

[a] Ztschr. Fleisch u. Milchhyg., 22 (1912), No. 10, pp. 302, 303.

P. sexalatus were found in all but one. In a mixed infection, however, it has never been found as abundantly as *A. strongylina*. This worm has apparently the same habit of injuring the mucosa as has *A. strongylina*, as both species were found in the same necrotic tissue in a hog's stomach. It must therefore be considered only less dangerous because it is less abundant, and should be subject to the same general prophylactic treatment.

"Nothing is known in regard to the life cycle of these parasites, but their wide distribution and frequency of occurrence suggest a simple life history without an intermediate host. The fact that the eggshells of both species are relatively thick would seem to indicate that the embryos are not liberated until the shell is dissolved by the gastric juice of the host. From the fact that the embryos are fairly well developed before oviposition, it may be inferred that the eggs require but a short period of incubation."

A key for use in identification of roundworms parasitic in domestic swine, a classified list of roundworms parasitic in swine, and a bibliography of 46 titles are included.

The agglutination of the glanders bacillus by normal horse serum, A. M. Oyuela (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 21, pp. 929, 930*).—Following up the findings made by Nègre and Raynaud with human serum and the *Micrococcus melitensis*, the author investigated whether previously heating a serum to 56° C. would eliminate the possibility of obtaining a specific agglutination of the glanders bacillus with normal horse serum. Normal horse serum was found to agglutinate in dilutions of 1:100 (9 samples), 1:200 (8 samples), 1:300 (5 samples), and 1:500 (3 samples). With the heated serum agglutinations were noted in 1:100 (3 samples) and 1:200 (2 samples) dilution.

In regard to the value of the anaphylactic test for diagnosing glanders, N. N. Sirenskij (*Viestnik Obshch. Vet., 1912, No. 2, p. 79; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 2, p. 442*).—The passive anaphylasis reaction can not be relied upon as an aid for diagnosing glanders.

Glanders vaccine, R. S. Mackellar (*Amer. Vet. Rev., 42 (1912), No. 1, pp. 59–64*).—The author here gives the results of vaccinating against glanders with a vaccine which was prepared as follows: Three glycerin potato agar slants are inoculated with the glanders bacillus and incubated at 37° C. for 24 hours. To each of the tubes is added 2 cc. of sterile physiological salt solution and the surface growth made into an emulsion by rubbing it up with a stiff platinum wire. The emulsion obtained from the 3 tubes is then added to a flask containing 500 cc. of broth, incubated for 72 hours, and the suspension tested for purity. If it is a pure culture the flask with its contents is placed on a water bath and brought gradually up to 70°, where it is held for 2 hours. The contents of the tubes are then tested for sterility by inoculating some of the vaccine on glycerin potato agar and incubating at 37° for a period of 48 hours. If sterile, 50 cc. of a 5 per cent carbolic acid solution is added to 500 cc. of vaccine. The vaccine thus prepared contains about 100,000,000 bacteria per cubic centimeter.

"This vaccine is inoculated subcutaneously in 3 separated doses, a week apart, under aseptic precautions, viz, clipping the hair and washing point of inoculation with a 5 per cent carbolic or a 1:1,000 bichlorid solution. The first injection consists of 1 cc., the second 2½ cc., and the third 5 cc. of the vaccine. In some animals a marked thermic and local reaction occurs, lasting for several days. The local reaction in these cases is usually a large edematous swelling, which in a few instances has exuded a serous exudate. These cases, however, are rare, and it has been our experience that not over 1 or 2 per cent of the animals inoculated are incapacitated for continuing their regular work."

One of the stables in which the vaccine was used contained 150 draft animals. Fourteen of these were condemned on the basis of the physical and mallein test. The agglutination test showed that of the remaining 136 head 77 were reactors and had a reading of 1,000 and up to 10,000.

After administering the vaccines 2 or 3 animals (after the first injection) developed a negative phase and showed physical symptoms of glanders. These animals were destroyed. "The remainder of the animals in this stable were subjected to the vaccine treatment 6 months later, and again in 6 months from the second treatment. None of these animals treated in this manner have developed glanders up to the present time."

A report of progress in regard to preparing an immune serum against glanders was also given.

On the treatment of the pectoral form of influenza (Brustseuche) of the horse with salvarsan, NEVERMANN (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 14, pp. 241–246*).—Thirty-eight horses suffering from the pectoral form of influenza were treated with salvarsan, which was administered in 2 to 3 gm. doses, intravenously in 27 cases and intramuscularly in 11 cases.

Two of the 27 animals to which the salvarsan was administered intravenously died; in one, death was either due to paralysis of the heart as the direct result of an intoxication, or to an embolus; in the other case, to necrotic pneumonia. Ten of the other 25 cases to which the salvarsan was administered intravenously had a normal temperature within 24 hours and the temperature of the remaining 15 had fallen more or less. In one case a second administration of the drug was necessary. In 11 cases a thoracic dullness was present at the time of treatment and in 6 of the 14 remaining cases a dullness appeared during the further course of the disease.

In the 11 animals to which salvarsan was administered intramuscularly the beneficial influence of the drug on the further course of the disease was not so constant since a thoracic dullness developed in 5 of the 6 animals in which it had not appeared at the time of treatment. The body temperature of these animals was not influenced by the treatment. See also a previous note (E. S. R., 27, p. 289).

On salvarsan in the treatment of the pectoral form of influenza (Brustseuche) of the horse, KETTNER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 26, pp. 855, 856*).—This is a brief general review of the subject, in which the author calls attention to the beneficial results obtained from the use of this drug.

Transmission of a malignant new growth by means of a cell-free filtrate, P. ROUS (*Jour. Amer. Med. Assoc., 56 (1911), No. 3, p. 198*).—A tumor of the chicken, histologically a spindle-celled sarcoma, propagated since October, 1909, is said to have developed extreme malignancy. From a bit inoculated into the breast muscle of a susceptible fowl there develops rapidly a large, firm growth; metastasis takes place to the viscera; and often within 4 to 5 weeks the host dies. Characteristic growths followed the inoculation of small amounts of cell-free filtrate.

"The original sarcoma was found as a unique instance in a flock of healthy fowls; and, though susceptible normal chickens and others with the tumor have since been kept together in close quarters for long periods, no instance suggesting a natural infectivity of the growth has occurred. When inoculated, it is at first a local disease, very dependent on the good health of the host. At this time intercurrent illness of the fowl will check the nodule's growth or even cause it transiently to disappear. For long the sarcoma could be transferred only to fowls of the same pure-bred variety in which it arose, and this

only in an occasional individual; but like many tumors it has gained on repeated transplantation a heightened malignancy, and the power to grow in other varieties of the same animal. Yet in these it does not do well; and it has not been successfully transplanted to other species.

"Histologically the growth has always consisted of one type of cells, namely, spindle cells in bundles, with a slight, supporting, connective tissue framework. The picture does not in the least suggest a granuloma; and cultures from the growth remain sterile as regards bacteria. At the edge of the invading mass there is often practically no cellular reaction, but lymphocytes in small number may be present, as is common with tumors in general. Metastasis takes place early, through the blood stream, and the secondary nodules have the same character as the primary. Several instances of the sarcoma's direct extension into vessels have been encountered. The secondary growths are distributed, especially to the lungs, heart, and liver, and in the last organ are sometimes umbilicated. The host becomes emaciated, cold and drowsy, and shortly dies."

A filterable agent the cause of a second chicken tumor, an osteochondrosarcoma, P. Rous, J. B. Murphy, and W. H. Tytler (*Jour. Amer. Med. Assoc., 59 (1912), No. 20, pp. 1793, 1794*).—None of some 30 tumors obtained in the living fowl during a period of 10 months was similar histologically to the spindle-celled sarcoma described in the account above noted, but there were 2 that, like it, proved transplantable, namely, a tumor producing true cartilage and bone, and a curious spindle-celled sarcoma.

In this paper the authors report experiments which show that the osteochondromatous tumor is caused by a filterable agent. The original osteochondroma appeared as a discrete mass on the breastbone of an adult fowl. It was very hard, appeared to be of long standing, and projected symmetrically to either side of the sternal keel. Microscopically as well as clinically it seemed benign. The experiments show that the osteochondrosarcoma, like the spindle-celled sarcoma, can be produced in fowls hitherto normal, by an agent separable from the tumor cells and capable of passing through a Berkefeld filter, which holds back *Bacillus fluorescens liquefaciens*. It appears that the histologic character of the osteochondrosarcoma is due to a peculiarity of the causative agent which is retained when the latter is separated from the tissue of the growth. Thus the agent, when brought into contact with the connective tissue in voluntary muscle, produces not an ordinary spindle-celled sarcoma, but a growth that elaborates cartilage and finally bone.

"The nature of the agent causing the osteochondrosarcoma can not at present be stated. The agent causing the spindle-celled sarcoma is probably a living virus."

Contribution to the knowledge of fowl pest, F. Halász (*Közlem. Összehasonl. Élet és Kórtan Köréből, 10 (1912), No. 1–2, pp. 42–80, figs. 7*).—The author finds that when kept in a dark place the blood of fowls suffering from this disease remains virulent for 4 months, and that when kept in a sterile tube the disease may be transmitted by the blood after a period of 7 months. An acute and a chronic form of this disease can be distinguished in the pigeon both by clinical symptoms and by patho-anatomical changes. A bibliography of 28 titles is appended.

RURAL ENGINEERING.

Treatise on hydraulics, M. and T. Merriman (*New York and London, 1912, 9. ed., rev. and reset, pp. X+565, figs. 217*).—This book presents the subject of hydraulics with special reference to the needs of the technical student and the practicing engineer, and contains chapters on fundamental data; hydro-

statics; theoretical hydraulics; instruments and observations; flow of water over weirs, in conduits, in rivers, through orifices, tubes, and pipes; water supply and water power; dynamic pressure of water; water wheels, and turbines; naval hydromechanics; and pumps and pumping.

[An electrical irrigation project], C. P. Eldred (*Elect. World, 59 (1912), No. 24, pp. 1304–1307, figs. 4*).—An outline is given of a reclamation project irrigating 25,000 acres, providing a central steam turbine power plant which operates 3 pumps and generates electricity for the operation of 3 outlying pumping stations and 2 main stations. The building cost was about $38 per acre, and water now costs the farmer $1 per acre-foot, the operating charges being $1.50 per acre per year.

Water supply and drainage plans for agricultural uses and for isolated communities, E. Prüfer (*Maschinen Ztg., 10 (1912), No. 19, pp. 221–226, figs. 14*).—This describes the use of the hydraulic ram, pelton turbine, francis turbine, and hydropulser apparatus in their applications to pumping for farm water supply and land drainage.

Drain tile bulkheads (*Wyo. Farm Bul., 2 (1912), No. 3, pp. 206–208, figs. 2*).—Plans and specifications are given for a tile bulkhead with 2 wings in addition to the head wall, the junction of the head and wing walls being reenforced every foot of height.

Clearing pine lands, E. B. Ferris (*Mississippi Sta. Bul. 159, pp. 3–12, figs. 4*).—A revision of Bulletin 118, previously noted (E. S. R., 21, p. 84).

Sewage disposal at an Ohio institution, R. W. Pratt (*Engin. Rec., 66 (1912), No. 17, pp. 452–454, figs. 9*).—This gives the details of construction of an isolated sewage purification plant which satisfies the unusual requirements of safe disposal in a stream used directly for a municipal water supply, and notes experimental work as to its efficiency, illustrating the reliability of intermittent sand filtration, and the undesirability of using small threaded parts in connection with sprinkling filter apparatus. To effect this rigid purification, several successive treatments are used in the following order: Screen chamber; septic tanks; sprinkling filters; settling basins for the sprinkling filter effluent; intermittent sand filters; and final disinfection of the effluent. An accompanying table indicates the character of the sewage and final effluent under unfavorable working conditions, showing the efficiency of the sand filter.

Methods of sludge disposal, K. Imhoff (*Engin. News, 68 (1912), No. 17, pp. 758–760, figs. 7*).—Results of practical investigations and experiments on the disposal of sludge from large sewage purification plants indicate that the 2 best methods of disposal are its use for manurial purposes and for the filling in of low agricultural land. In both of these cases the sludge must first be dried, this being best effected upon a porous drying bed after the sludge has decomposed in an inoffensive odorless manner in a separate sludge tank, or in a double deck tank consisting of an ordinary settling chamber and a sludge decomposing chamber below.

Highway culverts, W. C. Buetow (*Cement Era, 10 (1912), No. 10, pp. 28–30, figs. 2*).—Working plans and specifications are given for a reenforced concrete drop and culvert of special design used by the Wisconsin Highway Commission, indicating that the factors governing rural culvert design are area of drainage basin, maximum rainfall per hour, surface slope and condition, and soil character.

Impermeability tests on concrete, J. L. Davis (*Engin. News, 68 (1912), No. 19, pp. 866–869, fig. 1*).—The results, with tables, of comparative tests of hydrated lime, puzzolan cement, clay, very fine cement, and extra cement, as means for rendering concrete impermeable indicate that hydrated lime is effective in producing impervious concrete, but that its use is a doubtful economy

except for resisting low-water pressure. The addition of hydrated lime increases the plasticity and mold-filling qualities of the concrete. Puzzolan cement is slightly less efficient and economical as a waterproofer than hydrated lime construction. Clay added to ordinary concrete gives beneficial results in permeability and strength with no practical effect in density, but compared with an equal excess of cement by weight it gives no advantage of practical importance in permeability or density, and results in a loss of strength, yet both processes give impermeable concrete under 80 lbs. pressure. The use of very fine cement causes a marked decrease in permeability, and for impermeability concrete should contain not less than 45 per cent of combined fine aggregate and cement and from 15 to 18 per cent of this entire dry mixture should be cement.

Tests of the variation of leakage with pressure in various mixtures indicate in all cases that leakage increases much more rapidly than pressure.

Waterproof concrete, A. GRITTNER (*Cement and Engin. News, 24 (1912), No. 11, pp. 322–324*).—Results, with tables, of tests of magnesia fluates and potash soap solutions for waterproofing concrete indicate that a waterproof concrete can be prepared by the application of fluates, but the operation is expensive as it requires a great deal of time and labor. By the application of an 8 per cent solution of potash soap instead of water in mixing, the concrete can be rendered sufficiently waterproof to satisfy all requirements. From 300 to 500 kg. of Portland cement should be used per cubic meter of concrete, varying with the quality of the cement.

Autoclave boiling test for cement, H. J. FORCE (*Engin. News, 67 (1912), No. 24, pp. 1111–1116, figs. 3*).—This article calls attention to several failures under ordinary conditions of concrete structures which have been built of cement passing the standard tests, and describes and gives test results of a new boiling test which requires, in addition to the standard tests, that the cement shall remain sound after being subjected to boiling under a 20-atmosphere pressure.

The investigations indicate that the failure of cement to pass the high-pressure boiling test is due to coarse granules of cement not thoroughly moistened in the setting process, thus indicating lack of seasoning in the cement and non-uniformity in grinding. The conclusions are that (1) only the fine material of cement enters into the reaction of setting; (2) the coarser particles of cement become fractured and broken with age, and the disintegration of these particles will assist the cement in passing the autoclave test; (3) the failure of cement to pass the ordinary boiling test or the high-pressure boiling test is not due to free lime or free magnesia; (4) increasing the fineness of unsound cement improves its quality; (5) finely ground cements are more constant in volume, and ordinarily show a considerably higher tensile strength on the sand briquettes, the difference being as much as 15 per cent.

[Concrete fence posts], F. M. WHITE (*Country Gent., 77 (1912), No. 40, pp. 18, 19, figs. 3*).—Results are given of investigations on the making and use of wire reenforced concrete fence and corner posts, with tables showing the strengths of different kinds of wire reenforcing, and the construction and strengths of different sized posts. The reenforcing to be most effective must be placed as near the outside of the post as possible.

[Agricultural machines and buildings], H. BEYER ET AL. (*Arb. Landw. Kammer Prov. Sachsen, 1908, No. 14, pp. 68, figs. 9*).—This book makes comparative investigations of the types of ground breaking and cultivating implements, drills, mowing machines, tractors, steam threshing machines, straw presses, and internal combustion motors in present use, and gives chapters on farm buildings and the proper use of electricity in agriculture.

[Cooperative experiments in soil preparation with different tools and implements], G. TIMBERG (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 3, pp. 198–202*).—A brief account is given of experiments conducted in Hungary by E. Razso, in which soil was prepared in the ordinary manner with plows and harrows as compared with soil worked with a rotary scarifying machine. A marked increase in the yield of small grains, sugar beets, and potatoes was obtained on the land prepared with the machine as compared with the yield on land worked with plow and harrow in the ordinary way.

The possibilities of working Swedish agricultural soils with rotating machines, H. J. DANNFELT (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 3, pp. 203–205*).—With reference to the above article, the merits of the rotary scarifying machine for working the soil are discussed and reasons for believing why it will not replace the plow in Swedish agriculture are given. Some of these are that it is not so well adapted to small areas and to working over irregular surfaces as the ordinary plow, and from an economic standpoint under these conditions does not put the ground in as good tilth.

The adjustment and repair of self-binders, R. M. DOLVE (*North Dakota Sta. Bul. 99, pp. 5–28, figs. 18*).—This bulletin deals comprehensively with the proper adjustment, care, and repair of the mechanical details of the self-binder under varying conditions of soil, crop, and atmosphere, and presents a plan for mounting the binder on a wagon truck with gasoline motor power to operate the machinery, thus assisting operations in wet-land harvesting.

It is stated that the average life of the binder in North Dakota is about 6 years, and that if this can be prolonged to 10 years, $400,000 may be saved from the gross outlay.

Spraying machinery, F. W. FAUROT (*Missouri Fruit Sta. Bul. 22, pp. 46, pls. 14*).—This is a revision of Bulletin 20, previously noted (E. S. R., 21, p. 658).

Barn plans, R. M. DOLVE (*North Dakota Sta. Bul. 97, pp. 59, figs. 24*).—This bulletin points out the principles of general application in the construction of buildings for the proper housing of farm animals and indicates what is sanitary, convenient, and modern in barn construction.

Plan and elevation drawings are given, with descriptions, of barns for beef cattle, dairy barns, feeding sheds for beef cattle, hog houses, horse and cattle barns, horse barns, sheep barns, and a laying house for hens. The designs are suggestive rather than specific, the plans being so arranged as to be adapted to variations and combinations to suit individual requirements.

Special attention is paid to the design of floors, foundations, frames, windows, and ventilators, from the standpoints of sanitation and safety in construction, working formulas being given for the design of frame sections and for the strengths of floor and foundation material. The King system of barn ventilation (E. S. R., 20, p. 989) is described, and a list of publications of this Department, dealing with silos and silage, is given.

The silo and its construction, J. H. SHEPPERD, G. L. MARTIN, and R. M. DOLVE (*North Dakota Sta. Bul. 98, pp. 27, figs. 11*).—This bulletin deals with the design, construction, and cost of wood stave, hollow block, and concrete silos. The size estimates are made on the basis of a cow being fed at the rate of 40 lbs. of silage per day for 240 days, and the pasture supplemented during the summer months with 20 lbs. of silage per day. Tables are given showing corresponding numbers of cows, tons of silage, acres of corn, silo dimensions, and capacity in tons, with comparative costs of construction.

Gasoline lighting plants, E. S. KEENE (*Farm and Ranch Rev., 8 (1912), No. 19, pp. 820–822, figs. 4*).—This article deals with the grading of gasoline according to its density, volatility, and oil content and presents the factors

governing its use for lighting in the cold process gas, the hollow-wire, and the central generator systems.

RURAL ECONOMICS.

What is farm management? W. J. SPILLMAN (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 259, pp. 84, fig. 1*).—This bulletin presents in part 1 an outline of the science of farm management, and in part 2 an outline of the work of the Office of Farm Management, together with a discussion of the principal problems under investigation and the investigational methods in use. The following is a summary of questions discussed in part 1: Farming as an occupation; selection of the farm; organization and equipment of the farm; selection of enterprises, or choosing the type of farming; technological processes on the farm; labor requirements of enterprises; seasonal distribution of labor; cropping systems; the area one man can farm; relation of magnitude of business to profit; the normal size of farms; reducing the cost of production; farm geography; farm equipment; factors of production in agriculture; cost of the farm dwelling; systems of operation; tenant farming; hired labor; the work schedule; care and upkeep of equipment; farm bookkeeping; purchasing supplies; marketing products; storage and care of farm products and supplies; crop and soil management; live stock management; study of successful farms; and managerial efficiency. Among the subjects discussed in part 2 the following may be noted: Farm economics; special farm management studies; farm management field studies and demonstrations; and utilization of cacti and dry land plants.

New views on agricultural economics, G. BORGHESANI (*Agr. Nod., 16 (1910), No. 13, pp. 170–172*).—This article presents a study of some of the principal factors entering into the cost of agricultural production in Italy and the factors which determine the price of agricultural products, together with some observations regarding the law of diminishing returns.

Traders, farmers, and agricultural organization, E. A. PRATT (*London, 1912, pp. 31*).—This booklet makes a number of inquiries into the alleged conflict of interests between traders, farmers, and consumers. The author gives special attention to the discussion of economic production, cheaper transportation, and a better system of marketing agricultural products, concluding that effective organization along cooperative lines in regard to each is indispensable to the well-being of British agriculture. This, it is contended, would mean the certain elimination of the really unnecessary middleman, but would advance and stimulate the legitimate interests of other traders and add greatly to the consumable wealth of the country.

Phenomena and laws relating to landed properties, A. LORIA (*Rev. Econ. Internat., 9 (1912), IV, No. 1, pp. 26–49*).—This article presents a discussion of some economic principles relating to the decreasing productivity of the earth, increasing rural productivity, rise of farm wages, increase of the benefits of agricultural capital, and improvement in the value of landed property, and of laws aiming at the increase and improvement of landed property, distribution of the products, the improvement of conditions of life for farm laborers, and the general promotion of land cultivation.

Agricultural credit in the United States, E. W. KEMMERER (*Amer. Econ. Rev., 2 (1912), No. 4, pp. 852–872*).—An article in which the author discusses at length the existing banking facilities of the United States for agricultural credit and their utilization by farmers, showing the inadequacy of such facilities by reason of the location of national banks and their inability to accept real estate as security. It is noted that 192 of the 7,301 national banks in

the United States, September 1, 1911, were located in the 12 largest cities of the country, and that while these cities represented 14 per cent of the country's population the banks had 37 per cent of the national banking capital, 33 per cent of the individual deposits, and 40 per cent of the loans.

Excerpts from opinions expressed by a number of bankers and business men are quoted to show that in general the bankers have not favored short-time unsecured loans to farmers, but that they are awakening to the advantages of these loans and are making efforts to get in closer touch with the farmer. It is further inferred that the average small farmer does not as yet realize that he can obtain such credit at a bank. It is shown, however, that it does not follow from this that farmers are not receiving credit, because in reality they are receiving it on a considerable scale in the form of book credits with merchants, although this is considered a very expensive way, as the farmer usually pays more than bank interest under the guise of increased prices.

The reasons assigned for this backward situation in the United States as compared with European countries in regard to agricultural credit are summarized as follows: (1) Vast areas of good land could be had almost for the asking and for generations labor and capital were so dear that intensive cultivation was generally unprofitable. (2) Farmers have not been forced by dire necessity to resort to credit as were the farmers of Germany when the Raiffeisen banks were organized. (3) A considerable part of the agricultural population is of a nomadic character. (4) Many farmers are isolated by reason of large farms. (5) There has been a rapid growth of the manufacturing and commercial business of the country, largely in the hands of the same class of people who control the bulk of the banking business. (6) The uncertainty of crops and the strongly seasonal character of the farmer's credit demands have complicated the question.

A number of cooperative credit systems are discussed for the greater use of bank credit in agriculture and how it may be obtained in the United States. The author concludes by saying that "the farmer must be educated by the banker, the press, and the agricultural school and college, to the advantages of credit as a means to the more efficient working of his farm."

School fund farm loans.—A practical way to secure better farm credit, J. H. MILLER (*Farmers Mail and Breeze, 42 (1912), No. 40, pp. 7, 31*).—In order to meet the increasing demands for long-time loans at a cheaper rate of interest for agricultural purposes, a plan is here suggested of loaning the school fund of Kansas, which amounts to more than $9,000,000, to farmers of the State for purchasing land. The loan, as suggested, should be granted only for the purchase of land, for periods not less than 8 years, and to no one who already owns as much as 160 acres. It is noted that the State of Oregon has been successfully lending its school fund in this way for at least 40 years.

Preliminary report on land and agricultural credit in Europe (*U. S. Senate, 62. Cong., 3. Sess., Doc. 967, 1912, pp. 32*).—This document submits a preliminary report on land and agricultural credit in Europe, including the letter of President Taft to the governors of States and the recommendation of Ambassador Myron T. Herrick in connection with the President's proposal with reference to agricultural credit in the United States. The report gives a brief description of the land and credit associations and corporations in Europe, their origin, development, and relations to the State, the laws creating and governing them, and the results obtained for the farmer and investor, together with suggestions for improving the land and agricultural credit facilities in the United States.

European cooperative rural credit systems (*U. S. Senate, 62. Cong., 3. Sess., Doc. 966, 1912, pp. 21*).—This document presents briefly correspondence, com-

ments, etc., relative to European credit systems and their adaptation to the needs of the American farmer.

Agricultural credit banks, O. R. HOBSON (*U. S. House of Representatives. 62. Cong., 2. Sess., Doc. 891, 1912, pp. 21*).—This document is a reprint of an article published in the *Journal of the Institute of Bankers*, London. It describes the functions of agricultural banks in detail, showing that they may be organized on three different principles, namely, (1) as State controlled institutions, (2) as joint stock, or private profit-earning, companies, and (3) cooperatively. The author considers the first two classes as unsuitable and gives briefly his reasons for rejecting them, but emphasizes the possibilities of cooperative banks for furnishing credit to farmers for longer terms at more reasonable rates of interest by presenting the results of the operation of such banks in European countries for a number of years.

Establishment of credit and local banks in France, H. VAN DEURSEN (*Rev. Écon. Internat., 9 (1912), IV, No. 1, pp. 84–124*).—This article discusses at length and illustrates the history and development of the banking system of France, special attention being directed to the establishment of local credit banks and their actual and potential resources. An analysis of the operation of these banks is made, and in connection therewith some remedies are proposed as a solution of a number of suggested defects in the system.

The United States beet-sugar industry and the tariff, R. G. BLAKEY (*Columbia Univ. Studies Polit. Sci., 47 (1912), No. 2, pp. 286*).—In connection with a historical sketch and survey of the beet-sugar industry in the United States, the author treats of the origin, rise, and development of the industry in Europe, discussing the cost of producing both cane and beet sugar in the United States and elsewhere, the relation of the industry to tariffs and prices, the sugar trust, freight rates, etc., giving at the same time some suggestions as to the possible improvement and indirect advantages of the industry from an economic point of view.

After a careful study and review of the industry the author concludes that the cost of growing beets is higher in the United States than in European countries, due chiefly to the large amount of hand labor required and to the higher wages in the United States. The manufacturing cost or cost of converting beets into sugar is found to be practically the same in Europe as in the United States. A lengthy bibliography is given.

Agricultural opportunities (*U. S. Dept. Com. and Labor, Bur. Immigr. and Nat. Agr. Opportunities, 1912 [West. States North. and South. Groups], pp. 32 each; Nos. 1, pp. 32; 2, pp. 36; 3, pp. 23; 4, pp. 32; 5, pp. 36*).—This is a series of bulletins containing information concerning the resources, products, physical characteristics, prices of land, and inducements to settlers, by States and geographic divisions in the United States, including Alaska.

Comparison of crop production in Germany and America, H. C. PRICE (*Agr. Student, 19 (1912), No. 3, pp. 193, 194*).—Some observations are here made regarding the relation between increased population and crop production in the United States and Germany.

It is noted that while the population in the former country increased 21 per cent during the last decade, the total production of grain increased only 1½ per cent, and the average annual production of cereal crops is shown to have decreased from 58.4 bu. per capita in 1899 to 49.1 bu. in 1909. The average yield per acre of wheat, rye, oats, barley, and potatoes is shown to have increased 59.5 per cent in Germany within the last 20 years, and 19.9 per cent in the United States within the last 18 years. The difference in favor of Germany's increased production is attributed to more scientific methods of cultivation, fertilization, and plant breeding.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 11, pp. 81–88, figs. 2*).—This report estimates the percentage of the 1911 corn crop on farms November 1, 1912 at 2.6 per cent (64,764,000 bu.), as against 4.3 per cent of the 1910 crop on farms 1 year ago.

Notes and tables are given showing a general review of crop conditions November 1, 1912, with comparisons; preliminary statement as to crop production in a number of countries as reported by the International Institute of Agriculture; farm value of important crops on dates indicated; hop movement in the United States; index price of farm products; report on cotton ginning; wheat surplus and deficiency by States; farm value of important products; normal temperature and precipitation statistics; monthly receipts and stocks of butter; comparative cost of producing crops on irrigated and nonirrigated lands; and range of prices of agricultural products at important markets.

Foreign crops, October, 1912, C. M. Daugherty (*U. S. Dept. Agr., Bur. Statis. Circ. 41, pp. 24*).—This circular presents notes and tables showing condition of crops, acreage, production, and estimated yield, together with other data relating to a number of crops, in the various foreign countries for 1912, with comparisons. The yield of wheat in Canada for 1912 is estimated at 205,685,300 bu., as compared with 215,918,500 bu. last year, the acreage being 9,758,000 acres or 619,159 acres less than in 1911. Other tables show area, production, average yield, etc., of the leading crops in various foreign countries.

[Farm crops of the British Empire, 1896–1910] (*Statis. Abs. Brit. Empire, 8 (1896–1910), pp. 231–280*).—Tables are given showing the production and consumption of farm products, number of live stock, etc., in the various parts of the British Empire in each of the years from 1896 to 1910. It is estimated that the production of wheat increased from 322,700,000 bu. in 1896 to 680,900,000 bu. in 1910. The total yield of oats increased from 280,500,000 bu. to 488,700,00 bu. during the same period.

Agricultural production, G. H. Knibbs (*Off. Yearbook Aust., 5 (1901–1911), pp. 359–437, figs. 2*).—This section presents briefly in notes and tables the agricultural progress of the Australian Commonwealth for a period of years.

The area under cultivation is shown to have increased from 1,188,282 acres in 1861 to 11,893,838 acres in 1911. For the last 10 years the area under crops is shown to have increased at a rate somewhat greater than that at which the population has increased, being 2,200 acres per 1,000 of population in 1901 and 2,688 acres in 1911. Of the total area in 1911, 61.99 per cent was under wheat, and 18.99 per cent under hay, the remainder being under crops of lesser importance. Other data are given showing area, production, prices, exports, imports, etc., of the principal crops and agricultural products by States for 1910–11 with comparisons.

AGRICULTURAL EDUCATION.

Agricultural instruction, G. Rabault (*9. Cong. Internat. Agr. Madrid, 1911, pp. 179–186*).—In this discussion of elementary and practical or professional agricultural instruction for the rural classes, the author concludes (1) that the village teacher should endeavor to develop in his pupils a taste for farm work and should give them a general instruction preparatory to agricultural apprenticeship; (2) that the practical instruction should be given only on experiment farms, where, above all, the intelligent use of farm machinery can be taught and where students can profit from new acquisitions to science and the most profitable farm procedures; (3) that this practical instruction should extend through one year, and students should be given remuneration for the work done each day; (4) that in each practical institution a society of patrons

should be established under the protection of the State, which society should propagate the idea of agricultural instruction on the one hand and on the other aid students going out from these schools to find positions on farms.

Agricultural instruction and instruction for the rural classes, L. H. ROBREDO (*9. Cong. Internat. Agr. Madrid, 1911, pp. 135–139*).—The author here points out how agricultural instruction may be made helpful to the rural classes.

Agricultural instruction and the return to the land, J. P. WAGNER (*9. Cong. Internat. Agr. Madrid, 1911, pp. 186–191*).—Following a discussion of this subject, the author concludes that in order to keep the boy on the farm the governments of all countries in which the small farm predominates should establish and foster agricultural winter schools by every possible means.

Rural cooperation in the curriculum of the agricultural winter schools, RABE (*Arb. Deut. Landw. Gesell., 1910, No. 167, pp. 125–133*).—This is a discussion of the advantages which have resulted from agricultural cooperation in Germany. The author recommends that instruction in cooperation be given in the agricultural winter school to foster its development.

Agricultural apprenticeships, E. MISCHLER (*Land u. Forstw. Unterrichts. Ztg., 25 (1911), No. 3–4, pp. 270–286*).—This is a report on the need, feasibility, and advantages of the introduction of a system of agricultural apprenticeships for the practical instruction of the small farmer and farm laborer, followed by discussions of the project.

Agricultural apprenticeships, STIEGER (*Arb. Deut. Landw., Gesell., 1910, No. 167, pp. 196–212*).—The author discusses the problems of agricultural apprenticeships in their relation to large and small farmers and the higher grade of farm laborers, and the present status of this instruction.

The moral and social mission of the modern farm woman, C. DA CUNHA CONTINHO (*9. Cong. Internat. Agr. Madrid, 1911, pp. 148–160*).—This article discusses the influence of the modern farm woman in the improvement of rural life in her rôle as mother of the family, conscientious and economic housewife, enlightened farm mistress, and in association work, and gives a brief account of the extent of professional agricultural instruction for women in Europe, the United States, and Canada.

Specialization in agricultural instruction, T. WESTERMANN (*9. Cong. Internat. Agr. Madrid, 1911, pp. 170–173*).—The author makes a brief statement concerning specialization in agricultural instruction in Denmark. In his opinion a well-organized, theoretical-practical course in an agricultural institute should always precede the special courses.

Review of agricultural instruction in Denmark, T. WESTERMANN (*9. Cong. Internat. Agr. Madrid, 1911, pp. 161–170*).—This is a review of the practical, secondary theoretical, itinerant, and higher agricultural instruction in Denmark.

Agricultural instruction for the rural classes in France, H. GROSJEAN (*9. Cong. Internat. Agr. Madrid, 1911, pp. 139–148*).—The author gives an account of the present facilities for instruction in agriculture for the rural classes in France as follows: (1) For children, by the elementary schools and the normal schools for the training of teachers of elementary schools; (2) for young men, by practical schools of agriculture, farm schools, special schools of horticulture, viticulture, dairying, etc., agricultural sections in connection with university institutions, winter schools, orphanages, and reform schools; (3) for young women, by permanent and traveling schools and agricultural housekeeping sections; (4) for adults, by agricultural lectures, personal and written consultations, agricultural publications, short courses, lectures for soldiers, demonstration fields, and agricultural exhibitions and fairs.

Report of the agricultural department of Norway, 1911 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1911, III, pp. LXXIII+631*).—This volume contains the usual administrative report, and brief reports of the various officials and educational and research institutions supported by the government for the advancement of agriculture in Norway.

The department of agriculture of the University of Cambridge, T. B. Wood (*Chem. World, 1 (1912), No. 10, pp. 335–338, figs. 6*).—An account of the development of, and present facilities for, agricultural instruction in the University of Cambridge.

Agricultural education (*Aust. Farm and Home, 21 (1912), No. 8, pp. 370–374, figs. 4*).—A brief review is given of the work accomplished by the Dookie Agricultural College and the Longerenong Agricultural College, both of which are under the control of the Australian Council of Agricultural Education.

The rural school; agricultural education and state aid, A. Wenz (*Dakota Farmer, 32 (1912), Nos. 6, p. 327; 7, pp. 394, 395, figs. 2; 8, pp. 456–459, fig. 1; 9, p. 505; 10, pp. 539, 540, fig. 1; 11, p. 580, fig. 1*).—This series of articles presents in detail the policy of state aid in Minnesota and its benefits as shown in the Cokato Agricultural High School. There are also brief references to what is being done along this line in other States.

Two types of rural schools, E. Burnham (*Teachers Col. Columbia Univ. Contrib. Ed., 1912, No. 51, pp. VII+129, figs. 7*).—The author states in his introduction that the "purpose of this study is to assemble reliable and correctly correlated data about the two types of rural schools most commonly under discussion at present—the district school and the consolidated school." The local areas chosen for investigation are in Trumbull County, Ohio, and in Kalamazoo County, Mich. Facts of economic and social significance have been collected and tabulated, and these results are presented as preliminary and essential to the best understanding of the information about the schools.

Country schools for country children, W. K. Tate (*World's Work, 24 (1912), No. 1, pp. 102–107, figs. 5*).—Observations made by the author while visiting the Page County (Iowa) country schools are presented.

The schools of Ohio, F. Miller (*Addresses Ann. Meeting Ohio Bd. Agr., 1912, pp. 36–39*).—According to this address, agriculture is taught to-day in something like 10,000 elementary schools and 800 high schools in Ohio. Before any attention had been given to rural life education in the Turtlecreek township schools, the supervisor of schools found that only 15 per cent of the pupils intended to remain on the farm; after agriculture had been taught in these same schools for 4 years, 85 per cent indicated that they intended to remain on the farm.

The itinerant dairy schools of Ardeche, A. Cadoret (*Indus. Lait. [Paris], 37 (1912), No. 28, pp. 477–484, figs. 3*).—An account of the curriculum and equipment of itinerant dairy schools in Ardeche and of the effect of this instruction on the dairy industry in that department.

The organization and nature of agricultural instruction in the army, F. Brandenburg (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 38, pp. 529–532, figs. 3*).—This is an account of the organization and methods of developing agricultural instruction in the German army.

Triennial report on veterinary instruction, 1909–1911 (*Rapport Triennal sur l'Enseignement Vétérinaire. Brussels, 1912, pp. 28*).—This is a report for the years 1909–1911, inclusive, on the organization, equipment, instruction, etc., of the State School of Veterinary Medicine at Cureghem.

New regulations concerning the curriculum of the Austrian veterinary high schools (*Tierärztl. Zentbl., 35 (1912), No. 19, pp. 290–292*).

Fundamentals of farming and farm life, E. J. KYLE and A. C. ELLIS (*New York, 1912, pp. XXXII+557, pls. 2, figs. 282*).—A text-book on elementary agriculture, which teaches first of all the fundamental principles of plant and animal growth and reproduction and of soil management. Not only in the general arrangement of topics, but also in the presentation of the details within each chapter, careful consideration is given to pedagogical order and method. Lists of suggestive questions, exercises, problems, and references for further reading are provided for each subject. Definite ways are pointed out in which home economics may be taught in the ordinary rural school.

A primer of agriculture, W. HOOK (*Packwood, Iowa [1912], pp. 64, figs. 18*).—The main purpose in publishing this primer was to interest boys and girls in the work of the farm. It contains 36 brief lessons on corn and kindred subjects.

Outline of agriculture for the elementary schools of Pennsylvania (*Harrisburg: Dept. Pub. Instr., 1912, pp. 12*).—The course as outlined provides for two years' work in the seventh and eighth grades.

Lessons on soil, E. J. RUSSELL (*Cambridge: Univ. Press, 1912, pp. XV+132, figs. 58*).—This is the first volume of the Cambridge Nature Study Series. It is intended principally for students from 12 to 14 years of age and also to offer suggestions to teachers. The lessons consist of practical experiments, which are preceded by a statement of the apparatus required. The experimental results in each subject are summarized.

Agricultural crops, K. HANSEN and O. CHRISTENSEN (*Landbrugets Kulturplanter. Copenhagen, 1912, pp. 224, figs. 26*).—This is the eighth edition of a textbook that first appeared in 1891 and is now generally used in Danish agricultural schools. The subjects treated include the small grains, legumes, root crops, clover and grasses, soiling crops, seed production, and commercial crops (rape, flax, hemp and hops, caraway, mustard, and tobacco). A chapter on the harvesting and storage of agricultural crops has been appended to the present edition.

Applied botany, G. A. WORKS (*School Sci. and Math., 12 (1912), No. 7, pp. 610–615*).—The phases of the course in botany which are here outlined are the results of 6 years' use of the material in an effort to develop a course adapted to the interests and needs of the constituency of a high school in a community which is essentially rural.

Methods of nature study, L. S. HAWKINS (*Cortland, N. Y.: State Normal School, 1912, pp. 56*).—A pamphlet for the use of students in methods of nature study and elementary agriculture.

Laboratory manual of first year science, J. L. THALMAN and ADA L. WECKEL (*Ann Arbor, 1912, pp. 95, figs. 19*).—The course outlined in this manual aims to acquaint the first-year high school student with some of the elementary truths of the physical, as well as the biological, sciences with a unified body of knowledge, by a logically arranged series of experiments.

Commercial geography, H. H. MILLER (*Manila: Bur. Ed., 1911, pp. 123, figs. 62*).—The object of this text, which is written for the Philippines, is "(1) to present data whereby the student may compare conditions in the Philippines with world industrial conditions, and (2) to stimulate and guide him to original investigation of local products and industrial problems." It comprises chapters on grains and fodders; vegetables and fruits; starches, sugar, and alcohol; beverage crops, spices, narcotics, and drugs; domestic animals and products obtained from them; products of the sea; oils, fats, and waxes; fibers and dyes; forest products, and minerals.

Save Iowa seed corn in September, M. L. MOSHER (*Iowa State Col. Agr. Ext. Bul. 9, 1912, pp. 8, figs. 4*).—Charts are given showing the results of demonstra-

tions conducted in 32 Iowa counties to show (1) the condition of seed corn planted in those counties, (2) the relation of yield to stand, (3) the amount of water in corn gathered at different times, and (4) the importance of using home-grown seed.

How to grow corn, E. K. THOMAS (*R. I. State Col. and Bd. Agr. Ext. Bul., 1 (1911), No. 10, pp. 32, figs. 13*).—This is a guide for growing and judging corn and taking notes on the work for use in the boys' corn contest.

Premium list (*R. I. State Col. and Bd. Agr. Ext. Bul., 1 (1912), No. 12, pp. 19, figs. 2*).—This bulletin contains the rules and regulations governing the Rhode Island corn growing, bread making, canning, and sewing contests, and the lists of prizes to be awarded in the adult and boys' and girls' contests.

Bread making, canning, sewing, E. K. THOMAS (*R. I. State Col. and Bd. Agr. Ext. Bul., 1 (1912), No. 11, pp. 24, figs. 8*).—Lessons are given in bread making, canning tomatoes, and sewing for girls' industrial contests.

Introduction to sewing course II of the girls' home economics clubs, FRANCES L. BROWN (*Agr. Ed. [Kans. Agr. Col.], 4 (1911), No. 1, pp. 23, figs. 13*).—This course was planned for the subfreshman classes in the Kansas College and deals with making undergarments.

MISCELLANEOUS.

Twenty-fifth Annual Report of Nebraska Station, 1911 (*Nebraska Sta. Rpt. 1911, pp. XXXII+287, figs. 38*).—This contains the organization list, a review of the work of the year, a financial statement as to the federal funds for the fiscal year ended June 30, 1911, and as to the remaining funds for the fiscal year ended July 31, 1911, and special articles abstracted elsewhere in this issue.

Report of work at McNeill Branch Experiment Station, 1907–1911, E. B. FERRIS (*Mississippi Sta. Bul. 158, pp. 3–31*).—The experimental data included in this report are for the most part abstracted elsewhere in this issue. Meteorological observations are also summarized.

Monthly Bulletin of the Department Library, September–October, 1912 (*U. S. Dept. Agr., Library Mo. Bul., 3 (1912), Nos. 9, pp. 267–299; 10, pp. 303–331*).—These numbers contain data for September and October, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES

Idaho University.—President J. A. MacLean has resigned to accept the presidency of the University of Manitoba, this becoming effective the last of February. Dean W. L. Carlyle of the college of agriculture has been designated acting president.

Kansas College and Station.—The east wing of the new agricultural building has been completed and is being occupied by the departments of agronomy, animal husbandry, milling industry, and poultry husbandry, and temporarily by the director's office. The completed wing also provides two crop laboratories with a locker capacity for 600 students, a soil laboratory for 400 students, two small soil laboratories for advanced students and station workers, laboratories for the milling industry, and a mill and seed house.

Announcement is made that the college is to organize a cooperative marketing bureau as a part of its extension activities, working through farmers' organizations and county agents. This undertaking follows a successful experiment in the cooperative marketing of apples last fall. The agronomy department is preparing a list of farmers and others having seed grains for sale.

The student enrollment is now 2,262, an increase of about 300 over the previous year, and nearly double that of 10 years ago. There are also nearly 400 students in the short courses, and 922 farmers were in attendance at the five-day institute meeting at the college in December.

W. M. Jardine has been appointed dean of the division of agriculture and acting director, vice E. H. Webster. George Helder has been appointed superintendent of the Fort Hays substation.

Louisiana Stations.—A new residence is being constructed at the Rice Station at Crowley for the assistant director, to cost about $3.500. The fourth annual Farmers' Demonstration Conference, held at the university January 6 to 17, attracted an attendance of 247.

Massachusetts College.—Marquis F. Dickinson has resigned as a member of the board of trustees.

Pennsylvania College and Station.—R. L. Watts has been appointed dean and director, beginning February 1. E. L. Worthen, of the North Carolina College and Station, has been appointed assistant professor of agronomy in the college and assistant agronomist in the station.

Estimates have been submitted for the ensuing biennium aggregating for the school of agriculture $590,000.

Porto Rico Federal Station.—Dr. Charles W. Hooker, entomologist of the station since October, 1911, died February 12, at the age of 30 years. Dr. Hooker was born at Westhampton, Mass., graduated at Amherst College in 1906, and obtained the degree of Ph. D. from the Massachusetts Agricultural College in 1909. Previous to his Porto Rico appointment he had been in the employ of the Bureau of Entomology of this Department, in connection with its deciduous fruit insect investigations, notably cranberry insects in Wisconsin. In Porto Rico he had been actively conducting investigations of the insect pests of coffee and citrus fruits, and also of bee-keeping, the results of which are awaiting publication.

EXPERIMENT STATION RECORD.

VOL. XXVIII. MARCH, 1913. No. 4.

The Act making appropriations for the support of the Department of Agriculture for the fiscal year ending June 30, 1914, considerably enlarges the powers and duties of the Department, provides for the maintenance and development of most of the present lines of work, and establishes a new high-water mark for the funds at its disposal. The total amount carried by the Act is $17,986,945, an increase of $1,335,449, or about eight per cent, over that of the present year and $1,086,929 in excess of that for the fiscal year of 1912, which had been the highest in the history of the Department. Many of the increased allotments are designed to provide for additional administrative and police duties and the extension of the demonstration work, but opportunity is also afforded each bureau for some development of its lines of research as well. The outcome as a whole may be regarded as both significant and encouraging, indicating a sustained public interest in the work of the Department and an increased recognition of the profits accruing to the country from the consistent and uninterrupted fostering of its agricultural development.

In its general form the law conforms closely to its immediate predecessor, but in addition to the provisions of a routine nature it contains considerable new legislation. In fact, it embodies practically all of the agricultural legislation enacted at the closing session of the Sixty-second Congress. Some of the principal matters which are included are the authorization of the appointment of a commission to investigate the subject of rural credit, a federal law for the protection of migratory game and insectivorous birds, and the regulation of commerce in serum, virus, etc., for the protection of domestic animals.

Widespread interest is now being manifested in the subject of increasing agricultural credit facilities. This interest found expression in a clause authorizing the President to appoint a commission of seven persons to cooperate with a commission, already designated by the Southern Commercial Congress, in a study in Europe of cooperative land mortgage banks, cooperative rural credit unions, and similar organizations. This commission is to serve without compensation, but is allowed $25,000 for the employment of assistants and other expenses.

President Wilson has recently announced as members of the commission Senator Duncan U. Fletcher of Florida, president of the Southern Commercial Congress; Hon. Thomas P. Gore of Oklahoma,

chairman of the newly appointed Senate Committee on Agriculture and Forestry; Hon. R. W. Moss of Indiana, chairman of the House Committee on Expenditures in the Department of Agriculture; Dr. C. J. Owens, managing director of the Southern Commercial Congress; Col. Harvie Jordan of Georgia, representing the Farmers' National Congress; President Kenyon L. Butterfield of the Massachusetts Agricultural College; and Prof. J. L. Coulter of the United States Bureau of the Census. Among other duties, it is expected that this commission will attend the forthcoming general assembly of the International Institute of Agriculture at Rome.

Another important measure to be incorporated in the Act is the so-called "McLean Bird Protection Bill." Under its provisions all wild geese, wild swans, brant, wild ducks, snipe, plover, woodcock, rail, wild pigeons, and all other migratory game and insectivorous birds which do not remain the entire year within any one State, are declared to be the property of the United States Government and their capture or destruction is prohibited except under regulations to be promulgated by the Department with the approval of the President. The Department is authorized to prescribe closed seasons for these species, within which seasons violations may be punished by a fine not to exceed $100, imprisonment for not over ninety days, or both. An appropriation of $10,000 is made for the enforcement of these provisions, under the administration of the Bureau of Biological Survey.

In order to prevent further dissemination of dangerous diseases conveyed by contaminated materials, interstate commerce in virus, serum, toxins, or analogous products for the treatment of animal diseases is restricted after July 1 to products manufactured in domestic establishments licensed by the Secretary of Agriculture, or imported from foreign countries under a permit from him. The Department is authorized to make all necessary inspections and to promulgate rules and regulations, and is granted an initial appropriation of $25,000 for its enforcement.

Nearly all of the regulatory or police functions hitherto placed upon the Department receive increased support. Thus $200,000 additional is granted to supplement the meat inspection act of 1906, which carries a permanent appropriation of $3,000,000 per annum, and the allotment for the enforcement of the food and drugs act is increased from $625,000 to $675,000. The maintenance of the plant quarantine is provided for with an appropriation of $40,000, $10,000 of which is immediately available, and the act is amended to permit of importations from quarantined countries by the Department itself for experimental or scientific purposes. Small increases are also granted for the enforcement of the insecticide act, making $95,000

available for this purpose, and for the seed inspection, the scope of which is extended to include lawn grass seed.

As usual, there is considerable new legislation relative to forestry matters. The action of the previous year increasing to 35 per cent the portion of the receipts from the National Forests to be expended locally for public schools and roads is made permanent law. Cooperation with the States under the Appalachian Forest Reserve Act of 1911 is continued with an appropriation of $75,000, in addition to any unused balances heretofore granted, and the act itself is amended to permit of the acquisition of lands encumbered by rights of way or other reservations not interfering with the use to which the lands would be put.

Further impetus is given to the work of segregating lands within the National Forests that may be open to entry under the homestead laws by increasing to $100,000 the funds available for their selection. Of this amount $35,000, together with any unexpended balance from the preceding year, is to be used for the survey and listing by Forest Service employees of those lands which are chiefly valuable for agriculture. In addition, the Bureau of Soils receives $20,000 for similar work in cooperation with the Forest Service, and $25,000 is granted to effect exchanges of lands and indemnity rights with the State of Montana, which is required to contribute an equal sum.

Great interest was again manifested by Congress in the Department's demonstration and extension work. An increase of $75,000 is granted for the farm management and demonstration work, making $375,000 available for the purpose, and an equal sum is provided for the cooperative demonstration work in the South. The campaign for the eradication of the cattle tick is stimulated by an increase from $250,000 to $325,000, with the proviso that none of this may be used for the construction of dipping vats or the purchase of dipping materials except for experimental or demonstration work by employees of the Bureau of Animal Industry. An allotment of $75,000 is made for demonstrations of the best method of combating hog cholera, and the gipsy moth campaign will receive $300,000 as compared with $284,840 at the present time.

Of the new lines of investigation which were authorized, the most important is that of marketing systems. It will be recalled that the previous act directed the Secretary to collect information relative to cooperative and other systems of marketing farm products in vogue in this country, and to make recommendations as to any further investigations of these and related questions. A comprehensive report was accordingly prepared by the Bureau of Statistics summarizing existing systems and advocating the establishment of a division of markets within the Department. This divi-

sion was not definitely established, but investigations were authorized under an appropriation of $50,000, of which $10,000 is immediately available, to enable the Secretary to acquire and disseminate "useful information on subjects connected with the marketing and distributing of farm products." He is also authorized to continue the studies under way for several years on the cost of food supplies at the farm and to the consumer.

Other new investigations for which specific appropriations are made include $2,500 for experiments in feeding and breeding ostriches, $10,000 for testing the waste, tensile strength, and bleaching qualities of the various standard grades of cotton, and $30,000 for a study of corn improvement. Authority is also given for studies of insecticides and insecticide machinery.

An exhibit by the Department illustrative of farming in the semiarid region, similar to that made at the International Dry Land Congress at Lethbridge, Alberta, last October, is provided for the next congress, which is to be held at Tulsa, Okla., with an appropriation of $20,000.

The appropriations of the Weather Bureau show an increase from $1,619,680 to $1,707,610. About half of this increase, or $45,000, is for the construction of two additional observatories. The remainder is apportioned among the various activities of the Bureau, $5,000 additional being available for investigations in climatology and evaporation.

The largest increase accorded any bureau is $360,880, which is received by the Bureau of Animal Industry, and brings its total to $2,031,196. The increased allotments are mainly for the meat inspection, serum inspection, hog-cholera demonstrations, and ostrich experiments already referred to. The dairy division, animal husbandry studies, pathological investigations, and cooperative experiments in animal feeding and breeding are maintained on the present basis, receiving $177,900, $52,180, $78,680, and $100.000, respectively. Authority is given the Secretary to prepare and sell at cost pathological and zoological specimens of scientific or educational value.

The Bureau of Plant Industry appropriation is increased from $2,323,580 to $2,667,995, the increases being in part accounted for by the additions to the demonstration work already noted, and the remainder chiefly by smaller increases apportioned among its large number of projects. The Congressional seed distribution, which was stricken from the bill in the Senate, was eventually continued on the usual basis, with an increase of $30,060. This makes $257,000 for the purpose, together with $39,000 for the purchase and distribution of drought resistant field seeds throughout the Great Plains area and other dry land sections of the country.

A portion of the horticultural work of the Bureau has been reorganized and a new section established, which includes the work with truck crops, potatoes, and sugar-beet seed, and the study of landscape and vegetable gardening, floriculture, and related subjects. The allotment for these purposes is $50,960, of which $10,000 is for the potato experiments. Some of the other large divisions of the Bureau will be those for fruit investigations, which will receive $92,000; the foreign seed and plant introduction, with $83,000; the cereal investigations, with $104,925; and the studies of crop production and land utilization under arid and semiarid conditions, with $205,000.

The Forest Service receives, as usual, by far the largest allotment, the aggregate being $5,399,679, as compared with $5,343,045 at present. There are also available the appropriations in connection with the Weeks act already referred to, and as at present, $200,000 for fighting forest fires in cases of extraordinary emergency. The bulk of the appropriation will, of course, be expended in the maintenance of the National Forests, but the Forest Service again has available $400,000 for permanent improvements, $83,728 for silviculture and dendrological experiments, $165,640 for reforestation, and $150,000 for fighting forest fires of a routine nature. The allotment for study of methods of wood distillation and preservation, timber testing, and wood utilization is reduced to $140,000, but small increases are granted for range and miscellaneous forest studies, and the dissemination of results.

The appropriations to the Bureau of Chemistry aggregate $1,058,140, an increase of $89,200, chiefly for the enforcement of the food and drugs act, as previously stated. A new item is the allotment of $40,000 for collaboration with other departments of the Government and other miscellaneous work, such as the examination of paper, ink, and other contract supplies.

The investigations in the Bureau of Soils are provided for substantially as at present. There is an increase of $5,000 for the soil fertility studies and a decrease of the same amount by the elimination of the investigations of the relation of soils to drainage and seepage waters, which were carried on for several years by the late Dr. W J McGee. The soil survey receives $175,000, an increase of $10,000, in addition to $20,000 for the examination of lands in forest reserves already referred to. The aggregate for the Bureau is $334,020.

An increase of $69,870 brings the total for the Bureau of Entomology to $742,210. Of this amount $10,000 is to be used in combating the range caterpillar, and the remainder is expected to provide for increased development and the addition of several new lines of work, including studies of fumigation practices.

The appropriations of the Biological Survey show an apparent reduction from $191,400 to $170,990, but this is largely because the

previous act contained special appropriations of $71,000 for the acquisition of additional game reserves, as compared with $5,000 in the present act, which authorizes the establishment and maintenance of a single additional winter elk refuge of 1,000 acres in Wyoming. The routine appropriations of the Bureau all receive small increases, the largest being that for the destruction of ground squirrels from $3,000 to $15,000.

The various activities of the Office of Experiment Stations were continued and in several instances slightly augmented. The total is $1,901,260, of which $1,440,000 is paid to the state experiment stations under the Hatch and Adams acts. Of the remainder $66,160 is for statutory salaries, $40,500 (a net increase of $3,000) for general expenses, and $23,000 (an increase of $7,240) for the agricultural education service. The nutrition and drainage investigations are continued on the present basis, receiving $16,000 and $97,600 respectively, and the lump fund for irrigation investigations is increased from $98,300 to $108,000.

The total for the insular stations is $110,000, of which the Hawaii and Porto Rico stations are allotted $30,000 each, as at present, and the Alaska stations $35,000, the additional $5,000 being necessary to reestablish the live stock experiments at Kodiak which were interrupted by the volcanic eruption of June 6, 1912. The Guam Station again receives $15,000 and may use $2,000 of this for the purchase of additional land. The sale of farm products from these stations is authorized as usual, but a clause included for many years making the receipts available for the maintenance of the stations, as is of course the practice in the state experiment stations, was eliminated on a point of order. This is expected to have the effect of reducing their total revenue by about $8,000.

The Office of Public Roads received one of the largest increases in the act, its appropriation rising from $202,120 to $279,400. This enlarges all branches of its work, $15,000 additional being available for inquiries and advice on road management, and an increase of $50,000 for studies of road materials and road construction and maintenance.

The work of the remaining branches is continued much as at present. The Division of Publications is granted $184,660 as compared with $219,700 in the previous act, but this decrease is in consequence of the transfer to the Public Printer last October of the work of distributing all Departmental publications. The Office of the Secretary will receive $303,820, the Bureau of Statistics $243,680, the Library $43,520, and the Division of Accounts and Disbursements $104,370. The allotment for rent in the District of Columbia is increased to $98,329, and the fund for contingent expenses remains at $106,066.

One item in the section providing for contingent expenses is of exceptional interest because of the event with which it is associated. This is the proviso that not exceeding $1,000 "may be used for the purchase of an oil painting of Honorable James Wilson, former Secretary of Agriculture." The act received the signature of President Taft on March 4, thereby antedating by a few hours the retirement of one with whom the work of the Department has long been associated in the public mind. Sixteen years had elapsed since his first appointment in 1897, so that for some time he had had the honor of both the longest occupancy of a cabinet position in American history and also of a period of service as Secretary of Agriculture nearly double that of his three predecessors combined.

The complete story of this remarkable epoch in our agriculture can not here be attempted, but a summary by Dr. E. F. Smith, of the Bureau of Plant Industry, speaking as the representative of the Department at a farewell reception tendered by the employees to the retiring Secretary, may well be quoted:

"In that sixteen years we have grown from less than twenty-five hundred persons occupied with problems for the betterment of agriculture to nearly fourteen thousand workers. We then expended less than three million dollars per annum on our work. The bill that has recently passed Congress directs us to expend nearly eighteen millions. Sixteen years ago we had very little influence at home and none abroad. To-day there is not a civilized country in the world that does not speak with respect and envy of our Department of Agriculture, and as for our standing at home, one has only to ask any well-educated farmer anywhere in this broad country."

Dr. Smith went on to emphasize the share of Secretary Wilson in this period of progress, saying in part: "You have been a part of all this vast growth. To you, more than to any other one man, all this is due. Your large foresight and wise administration have made it possible. It is true no man could have done it without many years at his disposal. These sixteen years of continuous service have been your good fortune, and ours, and, most of all, the good fortune of this great Nation."

As a part of the exercises of the evening a portrait bust of Secretary Wilson was unveiled—the gift of the employees of the Department. The original bronze is to be given to the retiring Secretary and a replica will be placed in the Library of the Department. The reception was held in the new National Museum, and was attended by some fifteen hundred of the employees and their families.

Prof. W. M. Hays, who had served as Assistant Secretary since the close of 1904, also retired with Secretary Wilson, and has been succeeded by Dr. B. T. Galloway, chief of the Bureau of Plant Industry and connected with the Department for more than twenty-five years.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The chemistry of arsenical insecticides, E. B. HOLLAND and J. C. REED (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 177–207*).—This is a second report on the chemistry of insecticides (E. S. R., 26, p. 21) which constitutes a part of the project on why and under what conditions insecticides burn foliage.

Finding that the various chemicals used for this purpose on the market were of variable composition, and, furthermore, that the methods employed and prescribed by manufacturers were indefinite, and yielded very variable products, the authors studied the methods of preparing and the properties of Paris green, calcium arsenite and lead arsenates. As a result of numerous experiments with the two general processes used commercially for making Paris green and their reactions a combination process, using copper acetate and sodium arsenite, together with sufficient acetic acid to offset the alkalinity of the arsenite, was found the most acceptable. The reaction is expressed as follows: 4 $Cu(C_2H_3O_2)_2H_2O + 6\ NaAsO_2 + 6\ C_2H_4O_2 = Cu(C_2H_3O_2)_2 .\ 3\ Cu(AsO_2 + 6\ NaC_2H_3O_2$. It "was easy to control, could be carried out at any temperature from that of the laboratory to boiling and gave a product of variable physical structure and of fine color. Solutions of different concentrations were tried, of which one-fifth molecular (M/5) for the acetate and one-half molecular (M/2) for the arsenite proved satisfactory. This process appeared to require less arsenic in excess than the ordinary method, although the work was performed on too small a scale to warrant positive statements to that effect."

Two greens obtained from manufacturers were examined and found to contain an excess of cupric oxid and acetic acid, may have been hydrolyzed by the washing process, which resulted in the formation of a basic acetate. The instantaneous green "was of a pale green color, and consisted of very small, irregular, angular particles with considerable impurity. It was cohesive, had a poor 'flow,' and the film test on glass [E. S. R., 12, p. 64] appeared whitish. The slow process green, on the other hand, had a brilliant green color of metallic luster, and was composed of minute green spheres of various sizes, together with a small amount of crystalline and fragmentary matter. It had an excellent 'flow' and the film test on glass was green. . . . Neither of the greens contained an excessive amount of free or of free and loosely combined arsenic, judging by the standard, although the slow process was decidedly the better in that respect."

A series of tests was conducted with the slow process sample of Paris green and various solvents. "Cold water dissolved a small amount of arsenic, boiling water very much more. The green appeared to resist hot water for a considerable time after which the change was noticeable. If the boiling had been continued all the arsenic would probably have passed into solution. The 0.1 per cent ammonium salts, exclusive of nitrite, dissolved on the average 58 per cent more arsenic that the corresponding sodium salts. In both instances the carbonate was the most active, followed respectively by the sulphate, chlorid, and nitrate. Sodium bicarbonate was apparently inactive under the conditions

employed. Free carbonic acid was effective and so was ammonia when in sufficient amount to overcome the resistance of the green, and jointly, carbonic acid and ammonia dissolved the most arsenic. It is evident from what has been stated that carbonic acid and ammonia of the atmosphere in conjunction with dew, fogs, or light rains and high temperature will materially increase the dissociation of Paris green. In conclusion it may be said that Paris green contains a fairly high percentage of arsenic, is nominally insoluble in water but unstable, hydrolizing readily under favorable conditions. It has a low power of suspension though its fineness permits of reasonable distribution. It is a poor indicator without lime of the leaf surface covered, but possesses fair adhesive qualities."

For preparing calcium arsenite, sodium arsenite was used because it is readily soluble, and proved satisfactory. A salt of fair quality can be procured on the market, or is easily prepared by a method which is given. As the alkalinity of the soda in sodium arsenite is not destroyed by the arsenous acid used, it should be run into the calcium chlorid solution slowly with constant agitation in order to prevent any precipitation of calcium hydroxid. An excess (10 per cent) of sodium arsenite was found desirable to perfect the salt. After standing several hours the liquor was removed by means of a Buchner funnel, and the lime arsenite washed rapidly with cold water until nearly free from chlorids.

To ascertain whether the resulting product was a definite compound, salts were produced by adding an excess of sodium arsenite to the calcium chlorid and vice versa, observing the usual precautions as to dilution, precipitation of calcium hydroxid, oxidation of the arsenic, etc. The small samples prepared in the laboratory were of uniform composition, indicating a definite compound of about 77 per cent arsenic content. This amount of arsenic exceeds the requirements of the ortho and pyro salts, and substantially conforms to that of the meta compound with a theoretical content of 77.92 per cent. Analyses of some commercial preparations are also given.

The calcium metarsenite, prepared according to the directions given, is a smooth white gelatinous mass or jell of very fine, adhesive particles. The power of suspension was extremely high but lessened by drying. Calcium arsenite is also probably the most soluble arsenical insecticide known, being "fairly soluble in cold water, but much more so in boiling water. The ammonium salts, exclusive of nitrite, dissolved about 19 per cent more arsenic than the corresponding sodium salts. The carbonate in both instances proved very effective, followed by the chlorid, sulphate, and nitrate with only slight differences between the latter. An interchange of bases must have resulted in many instances to permit the high solubility recorded. Carbonic acid, combined and free, was the most active of any single agent, consequently excess lime should afford one of the best methods of protection under atmospheric conditions. Ammonium hydroxid depressed slightly the solubility of the arsenic.

"Calcium metarsenite contains the highest percentage of arsenic of all the common insecticides, and is quite soluble except in presence of excess lime; the fineness of its particles and the high power of suspension insure uniform distribution; the white film readily indicates the surface covered; and its adhesiveness provides protection for a reasonable period under average weather conditions."

In the experiments on neutral lead arsenates, many attempts were made to prepare salts containing the arsenic and lead in the proper molecular ratio, di- and trisodium and ammonium arsenates being employed. The required salts were finally produced according to the following equation:

$$3Pb(C_2H_3O_2)_2\ 3H_2O + 2Na_2HAsO_4\ 7H_2O = Pb_3(AsO_4)_2 + 4NaC_2H_3O_2\ 3H_2O + 2C_2H_4O_2 + 11H_2O.$$

The principal difficulties arose from failure to add the strongly alkaline sodium arsenate slowly and with sufficient agitation to prevent the precipitation of lead hydroxid and to maintain an excess of at least 5 per cent of lead to prevent the formation of the acid salt. The lead salts so prepared contained a small amount of water which was probably held by occlusion and which could not be volatilized at 100° C. Acid lead arsenate can be readily prepared from nitrate of lead and sodium arsenite, providing dilute solutions are used and the sodium salt is added carefully in excess (10 per cent). Neutral and acid arsenates of lead are quite insoluble, although both salts will undoubtedly yield arsenic slowly to continuous percolation, the acid salt decomposing the more readily. One of the acid salts examined was practically insoluble under the conditions tested, nearly free from soluble by-products, and exceeded the requirements for the legal standard for such preparations.

"There is evidently a difference in stability between acid and neutral lead arsenates as measured by boiling ammoniacal solutions, but, contrary to general belief, it is apparently only a matter of degree. Both salts are decomposable, yielding soluble arsenic acid. . . . Stability is apparently the result of a reversible reaction, ammonia setting arsenic acid free, and lead hydroxid, when present in sufficient excess (10 per cent), completely reprecipitating it. . . . If properly made, neutral and acid arsenates of lead are smooth, white pastes of very fine particles, low specific gravity, excellent suspension and exceptional adhesiveness. The power of suspension is injured by drying."

A rapid microscopical method for the determination of arsenic, as orpiment, in shellac, R. SCHWARZ (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 660, 661*).—The method is as follows: "A 10 gm. average sample is ground fine in a coffee mill and then dissolved in 15 cc. of methyl alcohol, solution being hastened by shaking and warming the flask. The varnish is then poured into a graduated tapering tube and this revolved in a centrifugal machine for 5 to 6 minutes at 1,000 to 1,500 revolutions per minute. This causes the precipitation of the greater part of the insoluble material, which contains the orpiment. The varnish is then decanted, the precipitate shaken with methyl alcohol, and the tube again revolved in the centrifuge for 1 to 2 minutes. The alcohol is then decanted as thoroughly as possible, the amount of the precipitate recorded, and a small portion transferred to a microscopic slide by means of a capillary tube. This preparation is then carefully examined under the microscope, using a magnification of 450 to 600 diameters. With an ordinary brewers' shellac or varnish, containing a normal amount of insoluble material and above 150 parts of arsenic per million, several pieces of orpiment will be observed in each field."

The detection and determination of cyanogen and hydrogen cyanid, F. H. RHODES (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 652–655*).—"The present investigation was taken up to determine the applicability of the difference of behavior of cyanogen and hydrogen cyanid toward an acidified solution of silver nitrate to general qualitative gas analysis, and to ascertain whether this method could be used for the quantitative determination of cyanogen and hydrogen cyanid in the presence of each other."

"The results of the investigation may be summarized as follows: (1) Hydrogen cyanid is rapidly and quantitatively absorbed by a slightly acid solution of silver nitrate with the formation of silver cyanid. (2) Cyanogen is not absorbed by a slightly acid solution of silver nitrate and any cyanogen that may be dissolved as such in the solution is quantitatively removed when a current of air is passed through the liquid. (3) Cyanogen may be detected in the presence of hydrogen cyanid even when the total volume of cyanogen in the gas mixture is as small as 0.3 cc. The method is applicable to the detection

of small amounts of cyanogen in the presence of hydrogen cyanid and large volumes of air. (4) Hydrogen cyanid and cyanogen may be determined rapidly and accurately in the presence of each other."

A method for the detection and estimation of fluorin, A. GAUTIER and P. CLAUSMANN (*Ann. Falsif., 5 (1912), No. 45, pp. 329, 330*).—After giving a survey of existing methods and showing their shortcomings when used for substances containing small amounts of fluorin, a method is described for estimating and detecting small amounts of fluorin in minerals, waters, and tissues.

In the case of minerals which are not entirely decomposed with sulphuric acid the sample is fused with an alkaline carbonate and silica, and the resulting mass is extracted with water. The silica is then precipitated with ammonium carbonate, filtered off, and the filtrate concentrated for the estimation of fluorin. When the mineral substance can be decomposed with sulphuric acid the fluorin is liberated directly from a specially constructed gold crucible.

For waters the sample under examination is made faintly alkaline, from 0.3 to 0.4 gm. of sodium sulphate is added, and then followed by a slight excess of barium chlorid. The entire mixture is evaporated to dryness and the residue thoroughly extracted with cold water. An equal volume of 96 per cent alcohol is then added and the precipitate removed by centrifuging. The precipitate is finally washed with 65 per cent alcohol to remove chlorids. The fluorin is liberated from this precipitate by heating it in a gold crucible with sulphuric acid, and the vapors collected in a solution of potassium hydroxid. If much sulphate is present the method must be modified.

Plant or animal tissues must be dried, incinerated with calcium oxid or barium oxid at from 550 to 600° C., and when cool extracted with hydrochloric acid. The resulting extract is then treated in the same manner as the mineral water. A method of concentrating the extracts is also described.

The existence of sulphur fixed as sulphite in wool, H. STRUNK and H. PRIESS (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 2–3, pp. 136–144; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 542, I, pp. 147, 148*).—Confirming Grandmougin's results, it was found that wool kept in contact with large quantities of concentrated phosphoric acid liberated small quantities of sulphurous acid. The amount found, however, was too small to support the assumption that the sulphur in the keratin molecule is united with oxygen as sulphite. It was further noted that dry wool had a very great affinity for hydrogen sulphid, which is sufficient to explain the variations noted in the amount of sulphur in wool. The hydrogen sulphid fixed by wool can be easily oxidized to sulphurous or sulphuric acids.

The use of methylene blue as an indicator in iodometric titrations, F. S. SINNATT (*Analyst, 37 (1912), No. 435, pp. 252–254*).—This is a continuation of work previously noted (E. S. R., 24, p. 409).

It is shown that the usual commercial forms of methylene blue can be used as an indicator in iodometric determinations without interfering with the delicacy of the reaction. When an excessive amount of methylene blue is used a compound of iodin and methylene blue is produced, but this does not interfere with the color change. The presence of alcohol does not seem to interfere with the sensitiveness of the indicator, nor does the introduction of either chloroform or carbon tetrachlorid into the mixture affect the titration if the percentage of alcohol present is sufficient to prevent the organic solvent from separating.

Apparatus for fumeless Kjeldahl nitrogen digestion, A. P. SY (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 680, 681, figs. 2*).—The apparatus consists of a tube having two superimposed bulbs which is placed loosely in the

neck of the Kjeldahl flasks. The bulb tubes in turn are connected with a suction pump and can be utilized in series.

Neutral ammonium citrate solution, A. J. PATTEN and C. S. ROBINSON (*Michigan Sta. Tech. Bul. 12, pp. 3–12, figs. 3*).—Previously noted from another source (E. S. R., 26, p. 98; see also a note by Hall (E. S. R., 26, p. 709).

Determination of phosphorus by the citro-molybdate method, C. MULLER (*Bul. Assoc. Chim. Sucr. et Distill., 29 (1912), No. 9, pp. 619–622*).—In this work the author shows that much depends upon the amount of ammonium citrate solution (Petermann's formula) used with the molybdate solution (solution I, molybdic acid, pure, 50 gm.; ammonia, 22 Bäumé, 105 cc., and distilled water, 90 cc.; solution II, nitric acid, specific gravity, 1.42, 460 cc., and distilled water, 290 cc.), and that the best proportion is 1 part for every 50 parts of molybdate solution employed. If too much citrate is added, results are low. The yellow precipitate obtained should be dried at from 100 to 105° C. before weighing, and a correction of 0.03 gm. added to the weight owing to the solubility of the precipitate. The factor 0.0374 is used for converting into phosphoric anhydrid.

The effect of ignition on the solubility of soil phosphates, C. B. LIPMAN (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 663, 664*).—Using soils from various counties in California, it was found that on ignition the amount of soluble phosphoric acid diminished. Fraps (E. S. R., 26, p. 726) found the opposite result when working with phosphates as existing in minerals.

Determination of humus in Hawaiian soil, M. P. KELLEY and W. MCGEORGE (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 664–667, fig. 1*).—Previously noted from another source (E. S. R., 27, p. 7).

Chemistry of cellulose, C. G. SCHWALBE (*Die Chemie der Cellulose. Berlin, 1911, pp. XII+665*).—This large publication, which has particular reference to the textile and cellulose industries, is divided into the following chapters: Cotton cellulose; the celluloses occurring in nature (conjugated celluloses); the technical preparation of the raw material (conjugated celluloses); the manufacture of denatured cellulose products (mercerization, artificial silk, parchment paper, etc.); and analytical methods for cellulose chemistry.

The occurrence of pentosans and hydrolyzed pentosans in corn (maize) and corn products, C. E. G. PORST (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 205–212*).—The purpose of this work was to trace the pentosans from the corn kernel through the various products of disintegration down to the finished product. The methods used were the Councler, Tollens, and Krüger phloroglucin method for the determination of total pentosans, and the Votocek, Tollens, and Ellett alcohol extraction method for methyl pentosans.

In regard to the betains which occur in plants, E. SCHULZE and G. TRIER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 4, pp. 235–242*).—Continuing work previously noted (E. S. R., 26, p. 713) the authors report some additional compounds which may be classed with the betains. These were found in 2 labiates, namely, *Betonica officinalis* and *Stachys silvatica*, and have a composition corresponding to a dimethyl betain of oxyprolin. It is furthermore shown that betonicin, which was previously described (E. S. R., 27, p. 203) is accompanied by isomers or by similar bases. The separation of these compounds will be reported on later.

Some studies with large quantities of young vetch plants (*Vicia sativa*) showed that in the so-called betain fraction there was another base besides betain which simulated the betonicin base isolated from the labiates.

The presence of maltose in acid hydrolyzed starch products, G. DEFREN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*

13 (1912), Sect. VIa, pp. 111, 112).—Maltose was identified as an intermediate product during the hydrolysis of starch. The dextrose was removed by fermentation with *Saccharomyces apiculatus* and the dextrin precipitated with alcohol. The osazone characteristic of maltose was obtained from the crystallized and decolorized product. The findings set aside the oft repeated assertion that dextrose results only from the action of acids upon starch.

Research on Lintner's polarimetric method for the determination of starch, C. E. G. Porst and H. A. Crown (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 213–218*).—It was found that this method (E. S. R., 20, p. 1008) yields correct results if the rules laid down by Lintner are strictly adhered to, and furthermore that it checks up very well with the diastase and Sachsse methods. When protein is present in excess the results obtained are low. The method is rapid and the operator is not troubled with the fumes of hydrochloric acid if the mixture is kept at 20° C.

Determination of the glycerol content of fats, R. Willstätter and A. Madinaveitia (*Ber. Deut. Chem. Gesell., 45 (1912), No. 12, pp. 2825–2828*).—Although Zeisel and Fanto's method[a] for estimating glycerol in fat gives better results than either the acetin or the permanganate methods it possesses some disadvantages. If, however, the fat is heated slowly with hydriodic acid, specific gravity 1.8, the glycerol can be volatilized quantitatively as isopropyliodid, and thereby all the obstacles in the method are removed.

Lewkowitsch's method for determining the acetyl figure is without value because the fats become acetylized.

Characteristic color reaction for lecithin in eggs, C. Casanova (*Bol. Chim. Farm., 50 (1911), No. 9, pp. 309–313; abs. in Chem. Zentbl., 1911, II, No. 4, p. 231; Jour. Soc. Chem. Indus., 30 (1911), No. 16, p. 1030*).—In a solution containing lecithin all alcohol must be removed, and this can be accomplished by heating the solution for a time at 50 to 60° C. The lecithin is then extracted with ether, the solution (extract) concentrated and treated with 2 cc. of a 10 per cent solution of ammonium molybdate, and then covered with a layer of concentrated sulphuric acid. When lecithin is present a cherry-red coloration is obtained, which gradually changes to a greenish yellow and deep blue. Cholesterol and phytosterol have no influence upon the reaction.

Difficulties in the colorimetric estimation of vanillin, W. S. Hubbard (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 669, 670*).—Difficulties were experienced in obtaining a maximum color by the official method with vanilla extracts. "In a vanilla extract it is very difficult to add only enough lead cream to decolorize the solution and when different amounts of lead cream are used different depths of color are obtained. Dilution of the sample influences the color. It is shown that much larger amounts of ferrous sulphate are necessary in comparison with bromid water to produce a maximum color. It is shown that the lead cream forms a lead vanillin compound of the formula $(C_8H_7O_3)_2Pb$, and such being the case a quantitative estimation is impossible where the lead is used. It seems quite likely that the vanillin is oxidized to pyrocatechuic acid."

A simple apparatus for the gravimetric determination of benzoic acid, W. Frear (*Amer. Food Jour., 7 (1912), No. 8, p. 11, figs. 2*).—In this sublimation test an ordinary clay triangle holding a sheet of asbestos is placed upon a Chaddock burner. Upon the plate of asbestos is laid the fire clay ring which accompanies the burner, and upon the ring a heavier flat ring of asbestos ($\frac{1}{4}$ to $\frac{1}{3}$ in.) which has a center orifice of such a size as to receive the $2\frac{1}{8}$ in. copper ring of

[a] Ztschr. Landw. Versuchsw. Österr., 5 (1902), No. 5. pp. 729–745.

a water bath. A porcelain crucible holds the evaporated chloroform-ether extract of the sample under examination, and the sublimation head is a funnel of known weight plugged with absorbent cotton.

A series of tests made with the method and catsup containing known quantities of benzoic acid showed that it yielded results slightly below the theory, while the titrametric method gave results a little above the theory.

Quantitative oxidase measurements, H. H. BUNZEL (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *19* (*1912*), *Sect. VIIId, pp. 37–44, fig. 1*).—These experiments, which were conducted at Ogden, Utah, where tons of sugar beets are harvested each year, fully corroborate results previously obtained by the author (E. S. R., 24, p. 511; 26, p. 848; 27, p. 9) with diseased sugar beets grown in the greenhouse. The leaves of the plants affected with curly top had an oxidase content about twice as high as the healthy and normally developed plants, but no differences could be detected in the roots. An abnormally high oxidase content of the leaves was also noted in plants where the growth had been retarded.

Determination of the chlorin content of milk, B. G. EGGINK (*Chem. Weekbl., 8* (*1911*), *No. 48, pp. 904–906; abs. in Chem. Zentbl., 1912, I, No. 4, p. 285*).—Various samples of milk were examined according to the methods described in the Holland codex, the Bonnema method, the ashing method, and the Arnold method. The Arnold and the codex methods were the only ones which were satisfactory. The Bonnema method gave exceedingly low results.

A quick method for determining the degree of decomposition of milk, and a procedure for conducting the reductase test with methylene blue and fuchsin, H. BERTIN-SANS and E. GAUJOUX (*Bul. Soc. Pédiatrie Paris, 13* (*1911*), *No. 1, pp. 24–27, pl. 1; abs. in Rev. Gén. Lait., 8* (*1911*), *No. 22, pp. 525, 526; Molk. Ztg.* [*Hildesheim*], *26* (*1912*), *No. 26, p. 453*).—To 20 cc. of the milk, 3 drops of fuchsin (0.25 gm. dissolved in 50 cc. and water added to make 1,000 cc.), and 5 drops of methylene blue solution (0.25 gm. in 1,000 cc. of distilled water), are added. The mixture will then show an ash-gray color, but when heated to temperatures between 38 and 40° C. it becomes a lilac, which gradually goes over to a pink color and depends upon the state of preservation of the milk. A milk which will show these changes in color within ¼ hour is to be considered unfit for use; one which reacts within ¾ hour must not be employed for feeding infants; while a milk giving the reaction within 1½ hours must still be regarded with suspicion.

The analysis of altered milk, A. KLING (*Ann Falsif., 4* (*1911*), *No. 38, pp. 636–638; abs. in Chem. Abs., 6* (*1912*), *No. 8, p. 1038*).—After going over the details of his and Roy's methods, the author maintains that the modifications recommended by Ronnet [a] are of no particular value and liable to lead one into error. It is believed that by the procedure recommended a uniform sample can not be obtained in the aliquot. Ammonia is lost if no acid is added, and the presence of sand will cause bumping in the Kjeldahl flasks.

The author has modified the method "by washing the coagulum on the filter several times with distilled water, adding the washings to the first filtrate, partially drying the coagulum at 90 to 95° C., extracting 4 to 5 hours with acetone first and then with ether completely. Frothing in the Kjeldahl is lessened by leaving the material in contact with the acid for some hours, then raising the temperature slowly during the heating."

Sugar from corn, N. MARX (*La. Planter, 49* (*1912*), *No. 14, pp. 225, 226*).—A review of work done in regard to obtaining sugar from sweet corn stalks, some of which has already been noted (E. S. R., 24, p. 707).

[a] Ann. Falsif., 4 (1911), No. 37, pp. 557–561.

Report of the chemical seed control station at Christiania, S. HALS (*Ber. Stat. Kem. Kontrolstat. og Frökontrolanst. Kristiania, 1911, pp. 38; Aarsber. Offentl. Foranst. Landbr. Fremme, 1911, III, Statsforanst., pp. 133–168*).—The report presents the results of examining 2,402 samples of feeding stuffs, fertilizers, dairy products, etc., and 1,645 samples of seeds.

METEOROLOGY—WATER.

The fluctuating climate of North America, E. HUNTINGTON (*Geogr. Jour., 40 (1912), Nos. 3, pp. 264–280, pls. 4; 4, pp. 392–411, pls. 2, figs. 3*).—This article adduces evidence which is thought to show that the present climate of North America is different from that of the past, and that the climatic changes have been pulsatory, with long periods, and have been synchronous in America and Asia.

"The study of the trees of New Mexico and California . . . confirms the conclusions derived from examination of the ruins and physiographic evidences found in the drier parts of North America . . . [as well as] the theory of pulsatory climatic changes . . . having a period of hundreds of years. . . . The rate of growth of the trees indicates that in the distant historic past the moist epochs were on the whole moister than the similar epochs in more recent times. . . . We are led to conclude that the main climatic changes of America are synchronous with those of Asia and are of the same kind. This does not mean that changes in tropical countries are like those in the temperate zone. It does indicate, however, that in the temperate continental regions of the world periods of exceptional aridity or of exceptional moisture have occurred at the same time, and have sometimes lasted for centuries."

Meteorology, E. KLEINSCHMIDT (*Jahrb. Naturw., 27 (1911–12, pp. 105–126*).—This is a review in the usual form of recent progress in meteorology.

Bulletin of the Mount Weather Observatory (*U. S. Dept. Agr., Bul. Mount Weather Observ., 5, 1912, pt. 3, pp. 161–218, pls. 6, figs. 8*).—This number contains the following articles: The Dense Haze of June 10–11, 1912, by H. H. Kimball; The Influence of Clouds on the Distribution of Solar Radiation (illus.), by H. H. Kimball and E. R. Miller; Solar Radiation Intensities at Madison, Wis., by H. H. Kimball and E. R. Miller; and Free Air Data Above Mount Weather for April, May, and June, 1912 (illus.), by W. R. Blair.

Report on the meteorological observations made at the society's gardens at Wisley during 1911, R. H. CURTIS (*Jour. Roy. Hort. Soc., 38 (1912), No. 1, pp. 51–64, figs. 4*).—This report shows in text and diagrams the temperature of the air and soil, rainfall, sunshine, and direction and velocity of the wind for each month of the year. The general weather conditions of each month are also discussed, attention being called particularly to the severe drought of the summer, which, however, was balanced by the unusual rainfall of later months, and to the high average temperature of the year. There was a close agreement between the mean temperature of the air and of the soil at a depth of 1 ft. The temperature of the lower depths, however, lagged behind that of the upper layers of the soil.

Rainfall in France (*Jour. Roy. Soc. Arts, 61 (1912), No. 3136, p. 149*).—Data for rainfall at Paris, 1804 to 1904, are reported, and show "that the amount of rain in that locality is now more than one-seventh greater than it was a hundred years ago."

The rains of the Nile Basin and the Nile flood of 1910, J. I. CRAIG (*Survey Dept. Egypt Paper 26, 1912, pp. 110, pls. 11, fig. 1*).—Observations similar to those of previous years (E. S. R., 26, p. 118) are reported in detail.

The author states that since his report for 1909 was prepared, G. T. Walker has deduced an algebraic formula for the prediction of the Nile flood based upon comparisons of "the variations of the flood with pressure at Mauritius, in South America, and at Cairo; with rainfall at Zanzibar in April and May; and snow accumulation on the Himalayas in May. . . .

"[His] results lead to the equation—

$$\left\{\text{Nile flood}\right\} = +0.35\left\{\begin{matrix}\text{S. American}\\ \text{pressure}\end{matrix}\right\} - 0.29\left\{\begin{matrix}\text{Zanzibar}\\ \text{rainfall}\end{matrix}\right\} - 0.13\left\{\begin{matrix}\text{Snow}\\ \text{accumulation}\end{matrix}\right\}$$

where the braces denote 'proportional departures.' Translating this into absolute departures, we obtain the equation—

$$\triangle f = +4.37\triangle p - 0.55\triangle z - 1.3\triangle s$$

where $\triangle f$ is the percentage deviation of the flood from normal; $\triangle p$, the deviation of South American pressure ($\frac{1}{2}$March+April+May) in millimeters; $\triangle z$, the deviation of Zanzibar rainfall for April and May in inches; and $\triangle s$ the deviation of May snow accumulation.

"The formula gives results in very fair agreement with observation."

The working value of rainfall, J. R. Sutton (*Agr. Jour. Union So. Africa, 4 (1912), No. 4, pp. 600–605*).—From a study of rainfall at Kimberley, South Africa, the author concludes that from the point of view of irrigation "rainfall is worth considerably more than its face value . . . because in the dry months when the rain is short of the average the intensity of evaporation will be relatively greater than it is at other times. . . . On the whole, a gradual decrease of rain means a gradual increase of evaporation, especially from a porous surface such as the ground, and hence the necessity for an irrigation exceeding in quantity the shortage of rain."

The constitution of water, J. Duclaux (*Rev. Gén. Sci., 23 (1912), No. 23, pp. 881–887*).—This is a review of papers and discussions on this subject previously referred to (E. S. R., 24, p. 417).

Underground water resources of Iowa, W. H. Norton et al. (*U. S. Geol. Survey, Water-Supply Paper 293, pp. 994, pls. 18, figs. 6; Iowa Geol. Survey Ann. Rpts., 21 (1910–11), pp. 31–1214, pls. 18, figs. 7*).—This paper, which reports studies made in cooperation with the Iowa Geological Survey, deals with topography and climate, geology, geological occurrence of underground water, artesian phenomena, chemical composition of underground waters, municipal, domestic, and industrial water supplies, and mineral waters. The topography, geology, and underground water of each county are treated in detail.

One of the principal objects of the investigation was to determine and advise communities as to the location, depth, quality, and cost of artesian water. It is shown that "the artesian waters of the State, except some of minor importance, rise from a few related formations of early Paleozoic age. These formations underlie practically the entire State and form a well-defined artesian system. . . .

"Although Iowa has few rivers or lakes affording potable water through a considerable portion of the year, the conditions are unusually favorable for the storage of ground water and its easy utilization. Most of the features that tend to decrease the amount of surface water are features that tend to produce a large supply of ground water. . . . The level character of the prairie plain is such as to favor the ready absorption of rainfall by the soils and to cause the ground water to stand near the surface of the drift or the country rock and to be within easy reach of comparatively shallow wells. The gently rolling character of the topography insures good drainage, thus preventing stagnation of water on the surface, and lowers the ground-water level far enough to per-

mit purification of the downward percolating waters by filtration before they join the great underground system. The topographic conditions, in connection with drift soils such as are found throughout nearly all of the State of Iowa, insure a supply of underground waters at depths which permit most of the inhabitants outside of the large cities to be supplied at very slight cost."

Surface water supply of the North Atlantic coast, 1910 and 1911, C. C. BABB, C. C. COVERT, and R. H. BOLSTER (*U. S. Geol. Survey, Water-Supply Papers 281, pp. 305, pls. 2; 301, pp. 221, pls. 4*).—The river basins in this region are described and the results of stream measurements in the different basins are reported in detail.

Surface water supply of the St. Lawrence River basin, 1911, C. C. COVERT and R. H. BOLSTER (*U. S. Geol. Survey, Water-Supply Paper 304, pp. 98, pls. 4*).—The basin is described and stream measurements in it are reported in detail.

Surface water supply of the Ohio River basin, 1910, A. H. HORTON, M. R. HALL, and H. J. JACKSON (*U. S. Geol. Survey, Water-Supply Paper 283, pp. 158, pls. 2*).—This basin is described and the results of stream measurements in it are reported in detail.

Surface water supply of the Pacific coast in California, 1911, H. D. MCGLASHAN and R. H. BOLSTER (*U. S. Geol. Survey, Water-Supply Paper 311, pp. 304, pls. 4*).—This is one of a series of 12 reports giving results of measurements of stream flow in the United States in 1911. It describes the drainage basins of the Pacific coast in California and gives in detail the results of stream measurements therein.

Gazetteer of surface waters in Sacramento River basin, California, B. D. WOOD (*U. S. Geol. Survey, Water-Supply Paper 295, pp. 99*).—This is "the first of a series of reports on the surface waters of California, prepared by the United States Geological Survey under cooperative agreement with the State of California as represented by the State Conservation Commission and the State Board of Control (Water Powers). Every stream and gaging station in the Sacramento River basin is listed in this paper."

Water resources of California.—II, Stream measurements in San Joaquin River basin, H. D. MCGLASHAN and H. J. DEAN (*U. S. Geol. Survey, Water-Supply Paper 299, pp. 439, pls. 7*).—The basin is described and measurements of stream flow in it are recorded in detail.

A study of the phototransparency of potable waters and of saline solutions with reference to ultraviolet rays, W. S. and S. K. DZERSZGOWSKI (*Arch. Sci. Biol.* [*St. Petersb.*], *17 (1912), No. 3, pp. 219–239, figs. 2*).—The most important fact brought out in this study was that all substances, such as salts of iron, copper, cadmium, and manganese, which color or cloud the solution, reduce the phototransparency with reference to ultraviolet rays. This helps to explain the inefficiency of the ultraviolet ray treatment of colored or clouded waters to which others have called attention.

Recent advances in the science of water purification, A. KEMNA (*Surveyor, 42 (1912), No. 1093, pp. 889–893*).—This review deals more particularly with sand filtration, ozonization, and use of chlorid of lime, aluminum sulphate, lime, and ultraviolet rays. It is stated that "the chlorid of lime process constitutes the greatest advance which has been made in water purification during recent years." The treatment with ultraviolet rays is stated to be still in the experimental stage.

The sterilization of water supplies, with special reference to the "excess lime" method, A. C. HOUSTON (*Jour. State Med., 20 (1912), No. 12, pp. 727–737*).—This method is described and its successful application is reported. The

method depends upon the fact that when an excess of lime is added to water the latter acquires a bactericidal power. In applying the method a portion of water is treated with excess of lime to produce this bactericidal condition, and after a suitable interval this is mixed with enough untreated water to combine with the excess of lime.

The purification of city sewage by land treatment and biological methods, J. KÖNIG (*Chem. Ztg., 36 (1912), No. 115, pp. 1114, 1115*).—A comparative study of land treatment by the city of Münster, Germany, and biological treatment by the Dunbar system at the near-by town of Unna led to the conclusion that land purification was more effective than biological treatment and resulted in less loss of fertilizing matter. The results were, however, quite similar in other respects.

SOILS—FERTILIZERS.

A new method for the approximate mechanical analysis of soils, G. E. STONE and G. H. CHAPMAN (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 115–120, pl. 1, fig. 1*).—A rapid method for obtaining an approximate knowledge of the mechanical composition of a soil is described.

In this method 10 gm. of the thoroughly mixed and dried fine earth is first heated to determine the loss on ignition. It is then separated into different grades by sifting through 1 mm., 0.5 mm., 0.25 mm., and 0.1 mm. sieves, the last two being bolting cloth. One gm. of the residue, consisting of the very fine sand, the silts, and clay, is weighed and placed in a test tube having an upper or circular part of approximately 2 cm. diameter and 7 cm. length and a lower contracted flat part 10 cm. long with thin walls, one of which at least is perfectly flat, having an inside breadth of 0.8 cm. and a width of 1 to 1.5 mm., and filled to within about 4 cm. of the top with distilled water. The tube is closed with a rubber stopper and thoroughly shaken, then placed in the centrifuge, which is run for a period of 5 minutes at a speed of about 1,200 R. P. M.

"The tube is then removed and clamped to an upright stand . . . and a millimeter scale is attached so that with a horizontal microscope the size of the soil particles as shown by the eyepiece micrometer and the reading on the scale may be had at the same time or by swinging the microscope in a horizontal plane. Zero millimeter on the scale corresponds with the bottom of the soil column in the tube. The microscope is then focused on the soil particles and raised until a majority of the particles are less than the minimum size of those of fine sand, that is, less than 0.05 mm.; the scale reading is then taken and noted. The microscope is then raised until the particles are less than those of the minimum size for silts, viz. 0.0005 mm.: the scale reading is again noted and the scale reading at the top of the soil column also noted."

From these readings the volume percentages of the different constitutents are calculated. Comparative tests of the results of analysis of soils by this method and by the centrifugal method showed but little variation, the results being well within the limits of error, and the time required was reduced to one-half of that of the centrifugal method.

The determination of soluble salts of the soil by the electrical method, A. FLODERER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 42, pp. 579–581*).—The electrical method used by the Bureau of Soils of this Department for determining the percentage of alkali salts in soils is described, and the results of such determinations and their practical value in the study of the alkali soils (Szikböden) of Hungary by von Sigmond (E. S. R., 26, p. 223) are briefly reviewed.

Introduction of a new terminology in indicating the chemical composition of minerals and soils, A. A. J. DE SIGMOND (*Internat. Mitt. Bodenk., 2*

(*1912*), *No. 2–3, pp. 190–203*).—This is a full description of the author's proposed terminology which was briefly presented before the Seventh International Congress of Applied Chemistry in London, 1909. The reasons for unification of terms used in chemical analysis of soils are set forth, and examples of the application of the new terminology to certain well-known silicates and acid-soluble mineral parts of soils are given. "The new terminology embraces the percentage of positive and negative radicals, the gram equivalents of the radicals, and the percentages of the gram equivalents."

Investigations on alkali (Szik) soils, S. Floderer (*Kisérlet. Közlem., 15 (1912), No. 3, pp. 390–418, pls. 7*).—Experiments are reported in which the harmful salts, especially sodium salts, were rapidly removed by irrigation and the soils rendered suitable for the growth of crops.

The reclaimed soils responded to nitrates and phosphates but not to potash fertilizers. Sugar beets tolerated from 0.15 to 0.2 per cent total soluble salts in the soil, fodder beets an even larger amount; alfalfa from 0.1 to 0.15 per cent and even from 0.15 to 0.2 per cent, but was very sensitive to sodium salts; bird's-foot clover (*Lotus corniculatus*) tolerated from 0.2 to 0.3 per cent of total salts and 0.14 per cent of sodium salts.

Chernozem as understood by Lomonosov, A. A. Iabilov (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 526–536*).—Referring to the statement of Kossovich regarding the influence of Lomonosov's work on the development of studies of chernozem soil, particularly as regards its genetic origin, the author expresses the opinion that the present day conception of the soil and of the term chernozem was entirely unknown to Lomonosov.

Analysis of soils, B. C. Aston (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 3, pp. 219–227*).—Analyses of a considerable number of samples of soil sent in by farmers from different districts of New Zealand and of soil from the experiment station plats to determine any unusual conditions that might be present are reported.

The agricultural prospects and soils of the Pilliga Scrub, H. I. Jensen (*Dept. Agr. N. S. Wales, Farmers' Bul. 54, 1912, pp. 43, pl. 1*).—The author reports a reconnoissance survey including observations on the formation, physical and chemical characteristics, relation to timber growth, and agricultural value of the soils of the Pilliga Scrub region of New South Wales.

"The bulk of the Pilliga Scrub consists of soils of an alluvial or colluvial nature, detritus from the Warrumbungle Range, which accumulated in a depression for an immense period, and which subsequently became leached by the restoration of integrated drainage if the porous nature of the substrata did not contribute to the leaching. The alluvial and colluvial soils of the Gilgai, Baradine, and Bohena divisions overlie sands, gravels, and clays of Tertiary age." There are areas of volcanic soils.

The Gilgai soils which lie in an ancient lake bed are highly alkaline. "The alkalinity is largely due to high lime and magnesia percentage, but the soda present is quite sufficient to be highly injurious to crops in any but moist seasons. The greatest concentration of salts is found in the hummocks, from about 6 in. to 2 ft. from the surface, where one finds lime segregated in little nodules about the size of a pea." The Gilgai soils showed an unusually high degree of expansion on wetting.

The Baradine soils "are of diluvial or colluvial origin since no rock occurs anywhere in the district except a loosely cemented Tertiary sand-ironstone composed of sands and pebbles derived from the Warrumbungle Mountains."

The soils of the Bohena division consist mainly of diluvial or drift soils, and are very poor.

Many of the soils of the Pilliga Scrub, especially the Gilgai soils, were found to be highly manganiferous, the proportion of manganese (calculated as Mn_3O_4), varying from 0.062 to 0.27 per cent, and the hollow soils being richer in manganese than the hummock soils. There were indications that the character of the plant growth was influenced by the manganese content of the soil. "The red pine soils are relatively much richer in Mn_3O_4 than the red buddah soils. White pine grows on more manganiferous soils than black pine. Wattle soils contain no manganese. The sandy light-colored loams are almost free from manganese when they support open forest of mixed timbers, but where . . . they support dense pine, the manganese percentage is higher. . . .

"The manganiferous red soils of the Pilliga Scrub have the characteristics of excellent grape soils, and manganese is a desirable constituent in the cultivation of this vine. The Roma district in Queensland which has proved so excellent for viticulture has similar soils and climate."

The average composition of the principal soils examined was found to be as follows:

Average percentage of plant foods in each geological group.

Geology.	Moisture.	Volatile matter.	Nitrogen.	Lime (CaO).	Potash (K_2O).	Phosphoric acid (P_2O_5).
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Sandstone	0.87	3.69	0.053	0.067	0.044	0.076
Volcanic	4.46	7.89	.098	.405	.185	.159
Gilgai	5.39	6.42	.070	.568	.194	.118
Namoi alluvial	4.69	7.37	.140	.709	.375	.318
Yarrie Lake red drift	2.32	5.25	.105	.281	.127	.106
Baradine type drift	1.20	4.74	.089	.206	.155	.087
Sandy drift, Bokhara type	.60	2.07	.035	.067	.045	.075

Notes on the soils of Ugogo, P. VAGELER (*Pflanzer, 7 (1911), Nos. 10, pp. 565–569, fig. 1; 11, pp. 638–642; abs. in Zentbl. Agr. Chem., 41 (1912), No. 6, pp. 366–370*).—The origin, formation, character, and agricultural value of the soils of this region of German East Africa are briefly discussed.

The consistence and the plasticity of soils, A. ATTENBERG (*Internat. Mitt. Bodenk., 2 (1912), No. 2–3, pp. 149–189, figs. 21*).—This is an account of the author's studies of the plasticity and firmness of soils, reports of which have been noted from time to time (E. S. R., 26, p. 220).

Carbon dioxid of the air in the soil, G. I. ZHUKOV (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, p. 552*).—Analyses of samples of air drawn from different depths in soil which had been subjected to a variety of treatments are reported and discussed.

It was found that soils which had been so treated as to increase and conserve the moisture content contained more carbon dioxid than those which had not been so treated. The carbon dioxid content increased steadily until the latter part of August. The greatest amount was found at a depth of 30 cm. and the least at a depth of 10 cm. Manured soils and those under crops contained more carbon dioxid than unmanured and uncultivated soils. Sandy soils contained the least carbon dioxid and marshy soils the most.

Soil solutions, V. ISHCHEREKOV (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, pp. 558–560*).—This is a monograph containing 5 chapters dealing with (1) a survey of the literature of the subject and the possibility of determining the fertility of the soil by a study of its aqueous extract; (2) methods of obtaining soil solutions, including a description of the

method proposed by the author (E. S. R., 19, p. 409); (3) the composition and concentration of soil solutions; (4) the rôle of soil solutions in the nutrition of plants, based upon the results of the author's experiments during 1907 to 1909; and (5) soil sickness in the light of the work of Rousset (E. S. R., 24, p. 424) and the Bureau of Soils of this Department.

The author concludes in general that chemical analysis of the soil solution can not decide the question of fertility of the soil since it can not detect the substances injurious to plants, and the content of nutritive substances in the solution does not correspond with that of the soil itself. The infertility of a soil containing sufficient amounts of all of the nutritive substances, other conditions being favorable for plant growth, is due mainly to the accumulation in the soil of toxic products of the life activity of the plants. The injurious substances left in the soil by a given plant may be injurious not only to plants of the same species but of the same genus and family, but not to plants of other families. The injurious substances can be washed out of the soil.

The rôle of soil solutions in the nutrition of the plants, V. Ishcherekov (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, p. 560*).—Vegetation experiments with leached and unleached soils and with water extracts of soils are reported, the general conclusion being that most soils contain an excess of nutritive substances, which, however, vary greatly in availability. It is maintained that with a proper system of cropping and cultivation many soils like the Russian chernozem, which are thought to need fertilizers, may be made productive without the use of fertilizers.

Some results in fallowing land, J. W. Paterson and P. R. Scott (*Jour. Dept. Agr. Victoria, 10 (1912), No. 9, pp. 521–528, figs. 2*).—The authors review work by others on the water requirements of crops and report comparative studies of the water and the nitrate contents in soils of worked fallow, neglected fallow, and cropped soil plats. Oats was the crop grown, being harvested December 28. The soils were sampled to a depth of 18 in. at intervals of about 6 weeks from October 16 to February 28.

It was found at the close of these experiments that "the cropped soil contained 264 tons and the neglected fallow 211 tons less of water per acre in the first 18 in. than the corresponding worked fallow." The neglected fallow plat contained 39 per cent of the nitrates in the worked fallow plat. The cropped plat contained only a trace of nitrate during the early stages of growth of the oats. This was attributed to the great need of the young plants for nitrates. Later on the nitrate content of the cropped plat increased but remained considerably below that of the worked fallow plats.

A test of the effect of an application of nitrate of soda on the oat crop is also reported. The applications apparently increased the yield by 228 lbs. dry hay per acre.

The general conclusion from the experiments is that a well worked fallow prevents much loss of soil moisture during dry weather, besides increasing the nitrate content of the soil. A neglected fallow may do little good.

Dry farm moisture studies, A. Atkinson et al. (*Montana Sta. Bul. 87, pp. 47–78, figs. 15*).—Five seasons' studies of the moisture content in the upper 5 ft. of soil in cultivated and uncultivated fallow plats; in plats cropped with wheat, corn, and potatoes, and in open and enclosed range lands under dry-farming conditions of Montana are reported.

It was found that the wheat plants ceased growth when the moisture content of the soil was reduced to 8.69 per cent. There were evaporation losses from the soil after plant growth had ceased. The point at which the soil moisture ceased to be available to plants in an open, closely pastured range was reached some time between June 18 and 28. In areas not too closely grazed the moisture

content was much higher and the point where growth of plants ceased was not reached on the average until September 28. "This means a more vigorous growth through a longer growing season, and suggests the wisdom of not grazing range land too closely and of rotating range pastures."

The moisture content of continuously cropped land fell very quickly below the point where it is available for crops, indicating "that the growing of profitable yields of cereals on the same ground each year is not to be expected." Tilled fallow contained on an average 2.04 per cent more moisture for the first 5 ft. than uncultivated fallow. The tilled fallow contained 3.76 per cent available moisture as compared with 1.72 per cent for the untilled. It was also noted that there was a rapid decrease in the percentage of moisture in the uncultivated fallow soon after the warm period of June and July. Such loss was very small in the cultivated plats, thus suggesting "the importance of prompt and thorough attention to fallows about the time that the spring rains cease and the warm period commences." In the cultivated plats 17.6 per cent of the summer's rainfall was stored in the soil, the remainder, or 82.4 per cent, being lost or carried below the 5 ft. "In the uncultivated fallow not only was the summer precipitation lost, but also 1.01 per cent or one-eleventh of the moisture which was in the soil April 19." The average difference in yield of spring wheat on cultivated and uncultivated fallow plats was 5.34 bu. per acre. The moisture content of the cultivated plat was higher throughout the season. The moisture content in both plats was very rapidly reduced at the beginning of the warm weather during the latter part of June, thus showing the necessity for planting early maturing crops.

With potatoes it was found that the average moisture content was reduced 3.47 per cent "which, with the 10.64 per cent added as rainfall, makes 14.11 per cent moisture lost from this soil during the growth of the crop. In the case of corn the reduction was 3.95 per cent and this, with the 10.64 per cent added as rainfall, makes a total of 14.95 per cent loss during the growth of the corn crop. . . . These data show that intertilled crops permit the retention of a relatively large amount of soil moisture, and suggest the important place which such crops as corn and potatoes may hold in intelligently arranged dry-land crop rotations."

The moisture content of the soil and the yield of the crop showed very little difference for fall plowed or spring plowed plats. In general, the moisture content of soils was materially increased after a few seasons' cultivation and cropping.

The nitrogen and humus problem in dry farming, R. W. THATCHER (*Washington Sta. Bul. 105, pp. 16*).—The author reviews briefly investigations on the subject by others, and reports a comparative study of the nitrogen, organic matter, and humus contents in adjacent virgin and cultivated fields in the wheat belt of eastern Washington.

The results show in general "a significant reduction in the organic constituents of the soil by the present methods of 'dry-farming' operations." It appears that there has been an actual loss of nitrogen over that removed by crops. This loss is thought to be due almost entirely to volatilization in gaseous form of the organic soil constituents. Some loss was probably also due to surface erosion.

Studies of the influence of humus material on the weathering of silicates, H. NIKLAS (*Internat. Mitt. Bodenk., 2 (1912), No. 2–3, pp. 214–244*).—In these investigations 15 gm. each of powdered feldspar, augite, hornblende, olivine, mica, and labradorite were mixed with 300 gm. of peat in glass cylinders and kept under anaerobic conditions for 7 years, from 1901 to 1908. Qualitative and quantitative determinations of the decomposition products of the different

silicates were then made and the data compared for different methods of extraction of the material.

It was found that whereas extraction with water and with 2 per cent hydrochloric acid did not bring out the differences in the extent of decomposition of the silicates under the action of the humus, such differences were clearly shown by extraction with 2 per cent hydrochloric acid after incineration, and extraction after electrolysis. This was illustrated in the case of the latter method by the passing of the iron and aluminum of the silicates to the cathode.

Micro-organisms of the soil, G. T. Moore (*Science, n. ser., 36 (1912), No. 932, pp. 609–616*).—This is an article presented at the last Washington meeting of the American Association for the Advancement of Science. The article reviews the more important recent contributions to this subject, indicating the diverse character and yet the close interrelationship existing in the microbiological content of the soil. The author is of the opinion that the physiologist, bacteriologist, mycologist, algologist, and possibly the protozoologist, as well as the chemist and physicist, must cooperate before many fundamental problems involving fertility and plant nutrition can be finally solved.

Studies on nitrogen accumulation in the soil through micro-organisms, J. Dvořák (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 9, pp. 1077–1121, pls. 4, fig. 1; abs. in Chem. Abs., 7 (1913), No. 1, p. 198; Chem. Zentbl., 1912, II, No. 26, p. 2134*).—The author reviews investigations by others, particularly those of Stoklasa, on the subject, and reports in detail a study of (1) the influence of different plant substances as compared with glucose as sources of energy in the assimilation of free nitrogen of the air by *Azotobacter chroococcum;* (2) the influence of different plant substances and carbohydrates on the respiratory processes of micro-organisms; and (3) the biological absorption of nitrogen in the soil.

It was found in general that those substances with low carbon and high oxygen contents were the best sources of energy for *A. chroococcum* in the assimilation of free nitrogen, 5.73 mg. of nitrogen being assimilated per 100 gm. carbon in pine leaves as compared with 1,237.9 mg. per 100 gm. carbon in red clover. The largest amount of free nitrogen assimilated was 1,456.5 mg. per 100 gm. carbon, as glucose. The amount of free nitrogen assimilated per 100 gm. carbon in corn stalks was 280.4 mg.; in stalk and root residue of corn 596.8 mg.; and in wheat straw 325.4 mg. The retarding influence of the pine leaves on the assimilation of free nitrogen is thought to be due to the terpene and the tannic acid of the leaves. The larger assimilation with the straw and plant residue of the cereals was attributed to the high content of furfuroids.

The green matter of legumes (clover, alfalfa, and lupines) furnished the best nutrient media for the development of the micro-organisms of the soil in that it contained the carbohydrates in readily available form and supplied a well-balanced ratio of nitrogen and carbohydrate constituents. Such substances as straw and oak leaves do not contain carbohydrates which are readily changed into assimilable form.

In a study of the biological absorption of nitrogen, 250 gm. of soil was treated with 250 cc. of tenth-normal sterilized solutions of ammonium sulphate, sodium nitrate, and calcium nitrate, allowing the liquid to percolate through the soil for a period of 30 days, after which determinations were made of the ammonium and nitrate contents of the drainage water. One of the series of samples of soil was sterilized by steaming, and the others were not sterilized. The difference in the ammonium and nitrate contents of the drainage waters of the sterilized and unsterilized soils was attributed to the absorption of these constituents by the bacteria and termed the biological absorption.

It was found, in general, that the ammonium ion was absorbed much more energetically by all soils than the nitrate ion. Soils with an acid reaction, such as forest and meadow soils, showed the least absorption for all three solutions, whereas soils with neutral or alkali reactions showed the greatest absorption. Those soils which showed the highest absorption for ammonium sulphate also gave the highest absorption for the sodium and calcium nitrates. Soils showing the greatest physiological activity, as measured by the amount of carbon dioxid given off, also showed the greatest biological absorption of nitrogen. It is held, therefore, that the carbon dioxid content given off is not only a measure of the physiological activity of the bacteria of a given soil, but is also an indication of the extent of the biological absorption.

Nitrogenous soil constituents and their bearing on soil fertility, O. SCHREINER and J. J. SKINNER (*U. S. Dept. Agr., Bur. Soils Bul. 87, pp. 84, pls. 11, fig. 1*).—In continuation of previous work (E. S. R., 24, p. 301; 26, p. 419), a detailed study was made of the effect of a number of nitrogenous and related compounds, which have been isolated from soils in the laboratory of the Bureau of Soils from time to time, on the growth of wheat seedlings grown in water-culture solutions containing various combinations and proportions of phosphoric acid, potash, and nitrogen in concentrations of 80 parts per million, the organic compounds being added usually in amounts of 50 parts per million.

"Of the soil constituents tested, nucleic acid, hypoxanthin, xanthin, guanin, creatinin, creatin, histidin, and arginin are shown to be beneficial, cholin moderately beneficial, and picolin carboxylic acid moderately harmful. A considerable number of related nitrogenous compounds are also included in these investigations—some were beneficial, some were harmful, and some were without noticeable effect on growth." The beneficial substances appear to be able to replace nitrate in plant growth. Guanidin produces a diseased condition of the plants which is accentuated by nitrate. "Evidence is presented to show that the organic compounds are absorbed by plants as such, enter into the cell, and react with the protoplasm, causing effects either detrimental or beneficial, as the case may be."

A bibliography of the literature is added.

The natural fertility of cranberry bogs, F. W. MORSE (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 208–220*).—This is a preliminary report, based mainly on analyses of the drainage waters from fertilized and unfertilized miniature bogs, the latter consisting of 24-in. tile 48 in. deep filled with bog peat, and connected with a 6-in. tile that corresponds to the ditch on a large bog, by which the bog can be drained or irrigated. The purpose of the analyses was to show the development of soluble plant food in the peat and indicate the fertilizer requirements of the bogs.

The results show in general that the cranberry does not draw heavily on the fertility of the soil, and since "bog conditions do not favor nitrification and oxidation on account of the saturated soil and low temperature . . . the bog water is low in active fertilizing constituents, especially in nitrates." Practically all of the phosphoric acid and nearly two-fifths of the nitrogen were found in the slimy suspension present in the bog water.

The present status of soil sterilization, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 121–125, pls. 2*).—Investigations at the Massachusetts Station (E. S. R., 15, p. 158; 18, p. 221) are cited to show that the stimulating effects which sterilized soils have upon bacteria are chemical in nature and that biological factors, as reported by Russell and Hutchinson, exert no influence in this respect.

The adaptation of methods of sterilization to greenhouse soils and even to field soils is discussed, and the author expresses the opinion that "there is no reason why methods can not be adapted for cheap and effective sterilizing of outdoor soils if the land be fairly level and free from stone."

Soils and fertilizers, T. DIETRICH, G. KALB, and M. P. NEUMANN (*Jahresber. Agr. Chem., 3. ser., 14 (1911), pp. 50–231*).—This is a review of recent scientific literature on these subjects similar to those of previous years.

Experiments to determine the nitrogen absorption capacity of several well-known chemicals, H. D. HASKINS (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 26–30*).—One hundred gm. each of potassium, magnesium, calcium, and potassium-magnesium sulphates, and kainit was suspended over 450-gm. lots of manure in sealed bell jars and the nitrogen absorbed by the different salts during a period of 6 weeks was determined. In one series of experiments no air was admitted, in another a slow current of air freed from all traces of ammonia was drawn through the bell jars.

The amounts of nitrogen absorbed by the chemicals were comparatively insignificant, but apparently the magnesium sulphate was somewhat more effective as an absorbent than the other chemicals tested.

Chemical methods for the preservation of manure, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 31–34*).—Reviewing briefly German investigations on this subject, it is shown that apparently the cost of chemicals and the labor involved in the use of chemical preservatives are quite out of proportion to the value of the nitrogen saved. These investigations indicate that the most effective method of preservation is to keep the manure moist and well packed.

Report of the agriculturist, W. P. BROOKS (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 37–43*).—This is a brief account mainly of progress in fertilizer experiments which have been carried on at the station on a uniform plan for several years (E. S. R., 26, p. 31), including comparison of nitrogenous fertilizers on corn; muriate versus sulphate of potash on alfalfa, clover, asparagus, rhubarb, and blackberries; manure alone versus manure supplemented with potassium sulphate on corn; average corn fertilizer versus fertilizer richer in potash on corn; and comparison of barnyard manure, wood ashes, and a mixture of bone and muriate of potash as top-dressings for hay.

Shall we use "complete" commercial fertilizers in the corn belt? C. G. HOPKINS (*Illinois Sta. Circ. 165, pp. 12*).—The gist of the discussion in this paper is "that in profitable systems of general farming nitrogen should be secured from the air, potassium should be liberated from the inexhaustible supply naturally contained in all normal corn-belt soils, and that phosphorus should be purchased and applied liberally in low-priced fine-ground natural rock phosphate, ground limestone (likewise a low-priced natural fertilizer) also being used where needed."

Commercial fertilizers, J. S. BURD (*California Sta. Bul. 232, pp. 399–457*).—This bulletin contains analyses and valuations of the fertilizers inspected by the California fertilizer control during the fiscal year ended June 30, 1912. Nearly complete returns for the year indicate sales of over 50,000 tons.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1912, June, pp. 8*).—This contains the analysis and valuation of each fertilizer collected in the spring of 1912 in the brand name of which the word "potato" occurs. These include bone and tankage as well as complete fertilizers.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1912, Sept., pp. 12*).—Supplementing the above, the present publication reports analyses and valuations of other brands sold for growing

roots and vegetables, as well as the better grades of the remaining complete fertilizers of each manufacturer. The samples include muriate of potash, nitrate of soda, slag, lime, ashes, and complete fertilizers.

Inspection of fertilizers for 1912, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 162, pp. 13*).—Analyses of 180 samples of fertilizers collected under the direction of the state board of agriculture and turned over to the station for analysis are reported.

Digest and copy of fertilizer law (*New Jersey Stas. Circ. 9, pp. 8*).—A digest and the full text of the New Jersey state fertilizer law approved March 27, 1912, are given.

AGRICULTURAL BOTANY.

The effects of positive and negative electrical charges on seeds and seedlings, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 135–143, figs. 3*).—For a number of years the author has been carrying on experiments on the effect of electrical discharges on seeds and seedlings, which have been reported upon from time to time. In the present paper an account is given of investigations on seeds and seedlings of radishes and lettuce.

It appears that the effect of positive and negative stimulation on plants offers a mechanical explanation of the positive and negative galvanotropism in roots. When plants are grown between positive and negative electrodes, each electrode exerts a characteristic influence on the root, and that surface of the root nearest the anode will be affected according to the nature of the stimulus on that side. When weak currents are used the positive current or anode gives the greatest stimulation to those cells on the anode side of the root, and induces bending in the root toward the negative pole. On the other hand, strong positive currents induce bending toward the anode, due to a retardation or injury to the cells on the side of the root toward it.

From his various experiments the author believes that increasing the electrical tension or potential of the atmosphere, either by the use of static charges or from high-tension wires, gives rise to a greater degree of stimulation than passing the current through the soil. Alternating currents appear superior to direct currents in stimulating plants.

The effect of electrical stimulation on micro-organisms in the soil, nitrification, nitrogen fixation, etc., is a matter to be reported upon later.

New studies in electroculture, P. VOZÁRY (*Deut. Landw. Presse, 39 (1912), Nos. 84, p. 969; 85, pp. 985, 986, figs. 7*).—The author reports uniformly favorable results from the vegetative growth of wheat and cabbage plants kept under electrical discharges of high tension.

The relation of plant protoplasm to its environment, J. M. MACFARLANE (*Jour. Acad. Nat. Sci. Phila., 2. ser., 15 (1912), pp. 249–271*).—In this paper the author records observations and brings together results that are believed to aid in the estimation of the life capacities of plant protoplasm. A considerable portion of the report is devoted to thermophilous species of algæ and their possible relations with the phylogeny of plants.

It is claimed that plant protoplasm shows a degree of temperature adaptability that may range from −200 to +100° C. The most ancient and in structure the most primitive plants are believed to be the Schizophyceæ. This conclusion is based on their temperature relation, as they are believed to have been conspicuous in forming siliceous and calcareous beds encountered in some of the earlier geological strata. All thermo-resistant plant structures are said to have a rich and relatively dense protoplasm, or a stored mass of reserve material in the cells, that contribute to their thermo-resistant qualities. These

qualities are aided by the occurrence of mucilagenous walls or cell contents, or thick and pigmented cellulose or lignin, or cuticularized walls.

The author believes that protoplasm is a chemical compound that conforms to the same fundamental laws as do inorganic bodies, but which exhibits a greatly more complex structure and capacity of adaptation and response to environal stimuli, owing to the greatly more complex combination of the organizing molecules.

It is thought that throughout the entire vegetable kingdom, at some stage in the life history of many plants, a wide ancestral adaptation capacity is shown by the cell protoplasm to temperature, light, and chemical agents. This is true not merely of spores and seeds, but also of other parts, and even entire plants among the Spermatophytes. The relative water content is believed to be the main determining agent in conferring varying degrees of response on all plants or plant parts, though this is considered probably correlated with the presence of varying coagulable proteids. It is thought that possibly the relation of the chromatin in the higher plants to protoplasm and water content may also have an important bearing on species adaptability.

Germination experiments, 1910–11, M. HEINRICH (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 165–178*).—This is a detailed account of experiments made on the germinability of *Anthoxanthum odoratum, Avena elatior,* and several species of Poa as affected by light and temperature, the results being given in tabular form.

The optimum germinating condition found for *A. elatior* was illumination with temperature varying between 20 and 30° C. A slightly lower rate of germination was shown by seeds kept in darkness at 20°. Poa germinated best in bright sunlight.

[Temperature and light and seed germination], E. LEHMANN (*Ztschr. Bot., 4 (1912), No. 7, pp. 465–529, fig. 1*).—The author in amplification of a report already noted (E. S. R., 27, p. 220) presents results which may be summarized in the following statements:

In many cases temperature determined whether or not the seeds under investigation should react to light; in other cases temperature did not seem to modify light influence. The temperature range of germinability in light was found to be considerably greater than that in darkness. The maximum and the minimum limit of light intensity consistent with germination was also determined for a number of plants, and the effect of normal and other variations of intensity and duration of light was studied. An extensive bibliography is appended.

The relations between changes in protein structure and respiration.—II, The influence of carbohydrates, phosphates, and oxidizers on ammonia formation and assimilation in killed plants, W. PALLADIN and N. IWANOFF (*Biochem. Ztschr., 42 (1912), No. 5, pp. 325–346, figs. 3; Izv. Imp. Akad. Nauk. (Bul. Acad. Imp. Sci. St. Petersb.), 6. ser., 1912, No. 8, pp. 573–594, figs. 3; abs. in Jour. Chem. Soc. [London], 102 (1912), Nos. 597, II, p. 672; 599, II, pp. 863, 864*).—Continuing work previously noted (E. S. R., 27, p. 426), the authors investigated by means of killed yeasts the conditions attending ammonia production and use, also such dependence as may exist between these processes and those of alcoholic fermentation and respiration. Following are some of the conclusions reached:

Autolysis in dead plants in water is accompanied by a notable formation of ammonia, also of ammonia-yielding substances. The formation of ammonia is checked by addition of phosphates but still more by use of glucose, autolysis thus appearing to be a reversible process. Lactose checks only in small degree,

and leucin not at all, the building of ammonia. Oxidizing reactions check the activity of proteolytic ferments and therewith the formation of ammonia.

It is claimed that this study on ammonia formation and use leads to the establishment of a relation of dependence between fermentation and the respiration process attending protein destruction.

Ammonia as a transformation product of nitrogen-containing substances in higher plants, II, W. BUTKEWITSCH (*Biochem. Ztschr., 41 (1912), No. 6, pp. 431–444, figs. 2*).—The author reports on his experiments made with germinating seeds of lupine to determine the relations of ammonia formation to carbon supply and oxygen access, substantially as follows:

In seedlings limited to the nutriment in the seeds, when they have exhausted the supply of carbon, a storing of ammonia takes place, the nitrogen of which amounts to about one-fifth the total amount in the dying plantlets. The material for this ammonia is held to be supplied at least in part from the amid group of asparagin. In cases where glucose is supplied to the plantlet, the formation of ammonia is greatly limited. Ammonia is not stored in absence of oxygen, and in such cases its formation is said to proceed almost as in plants under normal development.

The conclusion is reached that the formation of this store of ammonia is the result of complex processes depending upon oxygen access. Further communication on this subject is promised.

The nitrogen in variegated and normal leaves deprived of their chlorophyll, M. MOLLIARD (*Bul. Soc. Bot. France, 59 (1912), No. 4–5, pp. 341–345*).—A study has been made of the nitrogen content of green, variegated, and etiolated leaves, and the author reports an increase in the total nitrogen of variegated and etiolated leaves as well as in the abnormally colored portion of leaves which are usually green. Not only did he find the total nitrogen higher in the colored portion, but the proportion of soluble nitrogen was also greater. A comparison was made between green leaves and portions of plants that are normally uncolored, such as floral organs, and here the nitrogen content of the green leaves was considerably higher, although the percentage of soluble nitrogen was lower in the green leaves than in the floral organs.

The author concludes that chlorophyll plays a rôle in the condensation of transitory soluble nitrogenous substances, changing them into proteids.

The rôle of metallic salts in the assimilation of nitric nitrogen by green plants, O. DONY-HÉNAULT (*Bul. Soc. Chim. Belg., 26 (1912), No. 5, pp. 266–276; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 599, II, p. 862*).—The results obtained from the author's experiments with inorganic solutions, particularly with those of iron and manganese salts, and with living plants led to the statements that (1) the catalytic action of any given mineral depends chiefly upon the conditions of the medium, and (2) slight variations of alkalinity or acidity in a living organ may be sufficient to suspend the activity of one catalyzer and stimulate that of another. This conclusion is offered in opposition to the view that a specific ferment is responsible for each observed phenomenon of oxidation or reduction.

Contributions to the question of the effect of manganese upon plant development, T. PFEIFFER and E. BLANCK (*Landw. Vers. Stat., 77 (1912), No. 1–2, pp. 33–66, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1106–1109, fig. 1*).—As the result of two series of experiments with oats, one in pots the other in the open, it appears that while some experiments showed distinctly the stimulating action of manganese upon certain plants, causing an increased assimilation of nutritive substances from the soil, others were less conclusive; that 25 kg. of manganese

sesquioxid per hectare (22.25 lbs. per acre) is about the limit that is advisable to use; and that further investigations are necessary to secure practicably useful data on this question.

The study of loose combinations of oxygen in some colored bacteria and fungi, K. SHIBATA (*Jahrb. Wiss. Bot. [Pringsheim], 51 (1912), No. 2, pp. 179–235*).—As a result of the author's investigations, carried out with bacteria and other lower forms, the number of bacteria known to bind oxygen loosely was considerably extended. The same capability was found in case of a yeast and of *Monascus purpureus*. The stored oxygen begins to be gradually given off as soon as the pressure of the surrounding oxygen sinks to zero, and this separation continues for a considerable time in an atmosphere such as that of hydrogen, carbon dioxid, nitrous oxid, or other indifferent gas, as is easily demonstrable by use of aero-kinetic index bacteria. Pure or dilute carbon monoxid displaces the stored oxygen in the bacteria in question. This process is reversed on a sufficient increase of oxygen pressure. The same mutual relation with oxygen is exhibited by some other gases.

The capability of colored bacteria to store oxygen is retained for some time after the bacteria are killed by moderate heat or by narcotization with ether or chloroform gas. It is not possessed at all, however, by the colorless varieties. The loose combinations of oxygen are modified in characteristic ways by certain oxidizing and reducing agents and by cyanogen.

Parts of various higher plants, containing such coloring matters as carotin or xanthophyll, have been investigated for evidences of such loose oxygen combination, but as yet without positive results. It was found that the bacteria studied were obligate-aerobic but able to thrive under very slight oxygen pressure.

The various bacteria and fungi cultivated in air containing dilute carbon monoxid showed limitation of growth in characteristic ways. This is thought to be attributable to the direct poisonous influence of the carbon monoxid until a very low oxygen tension is reached, when disturbances of respiration set up other marked injurious effects.

It is claimed that the oxygen-binding agents are the lipochrome coloring matters. In case of Monascus this process was associated with a color-change which was studied spectroscopically.

By the method of gas analysis, the separation of loosely combined oxygen was found to be, in general, less than the corresponding change in case of hemoglobin to which it is said to be analogous. These bacteria are said to function as storers, but not as carriers of oxygen.

The biological significance of this storing of oxygen is claimed to be that in case of a temporary exclusion of oxygen, these bacteria can live for a time upon the supply given off from their own coloring matters. These, in this sense, are regulators of oxygen pressure, in a degree removing the aerobic bacteria from the danger of quick oxygen starvation.

Influence of soil decoctions from sterilized and unsterilized soils upon bacterial growth, C. A. LODGE and R. G. SMITH (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 126–134*).—An attempt has been made to ascertain the cause underlying the effects which sterilized and unsterilized soil decoctions have on bacterial development. Two types of soils were investigated, soil decoctions being made from them and sterilized in an autoclave. Three series of experiments were carried on with each soil. In the first series a sterilized and an unsterilized loam were used and the sterilized decoctions inoculated with ordinary soil bacteria. In the second series a sterilized and an unsterilized subsoil were used in addition to the above, the treatment being the same, while in the third

sterilized and unsterilized loam and subsoil were inoculated with a pure culture of *Bacillus subtilis*. The development of bacteria and the growth of soy beans in the different soils, amount of ammonia formed, etc., were determined.

The results show that the development of bacteria may be retarded or accelerated in soil decoctions by the use of sterilization. In decoctions of soil rich in organic matter the development of bacteria was greatly increased, while in soil deficient in organic matter the development of these organisms was retarded by sterilization. The stimulating or retarding effects on the development of bacteria of the two types of sterilized soil used were similar to those produced upon the growth of the crops, as had been previously noted (E. S. R., 18, p. 221).

From numerous examinations the authors were unable to determine the presence of protozoa in these soils, and as a biological factor this was eliminated in their experiments. Their results are held not to confirm those of Russell and Hutchinson (E. S. R., 22, p. 121), who maintain that protozoa influence the number of bacteria in the soil. The authors are of the opinion that the number of bacteria which develop in a soil depends upon the chemical and physical condition of the soil rather than upon the number of protozoa.

Bronzing of maple leaves, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 54, 55*).—A description is given of a somewhat common and peculiar effect on rock maple leaves which was noted during the past summer. The trouble is characterized by an absence of the typical green color. The leaves are more or less rigid, light in color, with a reddish brown tinge. Repeated examination of the leaves failed to show the presence of any pathogenic organism, and the trouble is believed to be purely one of physiological disturbance, the principal factors being a soil deficient in moisture and excessive transpiration.

Frost cracks, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 110–114, fig. 1*).—Attention is called to the frost cracks occurring on trees of many varieties, which are especially common during very cold winters. These cracks open in the winter when the temperature is low and close in the summer, and when not very large they sometimes heal over and disappear through the activities of callus growth. More often they persist for several years, causing more or less injury to the tree through bleeding in summer.

These frost cracks are said to be difficult to treat by the ordinary methods. The author has experimented with elastic cement as a filling to prevent the access of water between the cement and the wood, but found it practically impossible to prevent bleeding from these frost cracks.

A number of measurements are reported on the opening and closing of the orifices of some large frost cracks on elm trees, and the relation of these cracks to the meteorological data is discussed.

Chemical protection of plants against freezing. II, N. A. MAKSIMOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 4, pp. 497–525; abs. in Ber. Deut. Bot. Gesell., 30 (1912), No. 6, pp. 293–305*).—In continuation of communications previously noted (E. S. R., 27, p. 333), the author reports that solutions of various inorganic salts, also of salts from several organic acids, have been found to protect sections of red cabbage immersed therein against cold. This is true, however, only of solutions of low melting point and nonpoisonous character. In case of a solution very favorable in these respects the protective influence shows a close dependence upon the degree of concentration, corresponding to that shown by a glucose solution of equal osmotic pressure.

It appears that the degree of protection does not depend upon the length of time the plant is kept in the solution. Transfer of the section to water or to a nonprotective solution is followed by a restoration of the original degree of resistance to cold. Protection does not appear to depend upon the permeability

of the protoplasm. This fact and others observed led to the conclusion that the protective influence is exerted in some way upon the outer surface or layer of the protoplasm, also that the progress of freezing injures this layer, inasmuch as such injury leads to a loss of the normal impermeability of the cell, followed by its death.

A first study of the influence of the starvation of the ascendants upon the characteristics of the descendants, II, J. A. HARRIS (*Amer. Nat., 46 (1912), No. 551, pp. 656–674, figs. 4*).—In continuation of a previous article (E. S. R., 27, p. 636), the author presents the data relating to his study of the constants of different varieties of beans to determine the influence of starvation on the descendants. These constants were based on the countings of ovules and seeds in about 130,000 pods and weighings of over 110,000 seeds, the observation being drawn from about 21,000 individual plants.

It was found that environmental conditions which greatly reduced the number of pods per plant, number of ovules formed per pod, and number of seeds matured per pod affected to a less degree the relative number of seeds matured and had but little effect on seed weight.

The author concludes that the influence of a modification of the ascendants upon the characteristics of the descendants is extremely slight. There did appear, however, a definite reduction in the number of pods per plant and number of ovules per pod, and there was also a possible lowering of the absolute and relative number of seeds per pod.

Notes on color inheritance in maize, R. H. LOCK (*Ann. Roy. Bot. Gard. Peradeniya, 5 (1912), No. 4, pp. 257–264*).—This article gives a summary of the conclusions arrived at by East and Hayes (E. S. R., 25, p. 736), so far as they apply to investigations of the author. In addition, he discusses his investigations since 1906.

Heredity, correlation, and variation in garden peas, J. K. SHAW (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 82–101*).—In continuation of a previous report (E. S. R., 24, p. 228), the author gives an additional account of studies with garden peas in relation to their heredity, correlation, and variation. The principal characters that have been studied are vine length and number of pods per vine, the length of the vine being taken as an expression of the vegetative vigor of the plant and the number of pods as its reproductive power. The figures obtained for vine length seem to indicate that some and perhaps all varieties of garden peas are composed of strains which have different hereditary vine lengths.

According to the author, the work thus far completed does not indicate anything as to the origin or permanency of these units or strains. They may have arisen by mutation, gradual differentiation, or hybridization, and it is not known whether they are permanent or not.

The author does not believe that the number of pods per vine is in itself inherited in any degree. Vine length and presumably the number of nodes may be in some degree inherited, and as a longer vine and more numerous nodes give additional opportunity for pod setting, productiveness may be indirectly passed from one generation to another.

Methods of selection for plant improvement, J. K. SHAW (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 21–25, fig. 1*).—The author describes a method applicable to garden peas of improving the plants by selection breeding.

Determination of the races of cultivated plants, E. DE CILLIS (*Atti R. Ist. Incoragg. Napoli, 6. ser., 63 (1911), pp. 173–198*).—The author offers what is claimed to be a new practical method of determining the races of cultivated plants, with special reference to the cereals, the discussion of mathematical and other phases being carried out somewhat in detail.

Structural relations in xenoparasitism, W. A. CANNON (*Amer. Nat., 46 (1912), No. 551, pp. 675–681, figs. 2*).—In connection with previous studies on induced parasitism (E. S. R., 26, p. 433), the author reports on an examination of the structural relationship of *Cissus laciniata* and its host plant, *Opuntia blakeana.*

The roots developed by Cissus showed several important differences from those of free-growing roots, and the host tissues were similarly modified. Where the roots grew rapidly, contact was made with the living parenchyma of the cactus, and the parasites were able to absorb foods and food materials. However, where the growth was slow, wound tissue was developed by the cactus, rendering the parasitic relation an unfavorable one.

The report concludes with a contrasting of the structural relations of a haustorium of a habitual parasite with the analogous absorbing organs of the xenoparasite mentioned above.

Seeds and plants imported during the period from October 1 to December 31, 1911—Inventory No. 29 (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 261, pp. 65*).—This gives a list of the seeds and plants secured by the Office of Foreign Seeds and Plant Introduction during the period indicated, 430 numbers being included. The collections are miscellaneous ones, but include a considerable number obtained by F. N. Meyer in central Asia, and some of these it is believed will prove valuable in plant breeding to secure hardy and more drought-resistant fruits, forage crops, and grains for the North and Northwest.

Laboratory guide in bacteriology, P. G. HEINEMANN (*Chicago, 1911, 2. ed., pp. XV+210*).—This edition has been revised and enlarged to meet modern requirements and includes the outlines of a course in soil bacteriology.

FIELD CROPS.

The chemical composition of crops as affected by different quantities of irrigation water, J. A. WIDTSOE and R. STEWART (*Utah Sta. Bul. 120, pp. 205–240*).—The crops used in this investigation were obtained in irrigation experiments previously noted (E. S. R., 28, p. 229). Tables are presented showing the chemical composition of crops grown with different quantities of irrigation water. In these experiments no crops suffered for want of irrigation, most of them receiving all the water necessary for maturing, and in many cases more than could be used to the best advantage. When much water was applied it distributed itself with regularity to considerable depths and when small quantities were used the distribution was equally regular but not so deep, and consequently the moisture environment is believed not to have been greatly different at any one time and the results secured are looked upon as minimum in their variations.

In the kernels of wheat, oats, barley, and corn the percentage of moisture was found to have increased slightly with the increase of irrigation water, but in the straw in these crops no regular correlation of the two factors was observed. The ash content in the kernels and the straw of these crops increased as the quantity of water was increased above the smallest irrigation. The percentage of ash rose rather steadily up to the maximum quantity of water used when it remained practically constant or fell slightly. With regard to ash content, alfalfa, timothy, *Bromus inermis*, orchard grass, and Italian rye grass showed the same tendency. Sugar beets and carrots also showed an increased percentage of ash as the quantity of irrigation water increased, but the increase was somewhat irregular. In cabbage the percentage of ash increased rather rapidly as the amount of water was raised from 12.5 to 25 in. The ash content of the potato crop remained practically constant with any quantity of

water used and with onions the percentage remained practically the same as the quantity of water was increased from 15 to 65 in.

The protein content of the seeds of wheat, oats, barley, and corn was larger when small quantities of water were used in irrigation than when the larger applications were made. In general the smaller the quantity of water used the larger the percentage of protein. In wheat kernels the diminution was from 18.05 per cent with 5 acre-inches of water to 15.98 per cent with 50 acre-inches. Oat kernels showed about the same diminution, barley kernels a little less, and in corn kernels yet a smaller decrease was observed. Alfalfa, timothy, *B. inermis*, orchard grass, and Italian rye grass showed that the percentage of protein decreased somewhat as the quantity of irrigation water was increased. The first crop of alfalfa, depending almost entirely upon the natural precipitation, showed practically no variation, the second crop unexpectedly showed an increase of protein as the water was increased, but the third crop showed a rather distinct decrease as greater quantities of water were used for irrigation. Timothy remained practically constant under varying conditions of irrigation; in *B. inermis* and orchard grass the protein decreased as the water increased, while in the first crop of Italian rye grass it remained practically the same and in the second crop it decreased distinctly with the increase in water. The results as a whole showed that with the fodder crops the percentage of protein tends to decrease as the quantity of water increases. Sugar beets and carrots did not show a marked variation in the percentage of protein as a result of varying quantities of irrigation water. In cabbage, the protein content decreased slightly as the quantity of water increased, but in onions the protein content showed a tendency to increase as the water was increased.

The percentage of ether extract was found to be so irregular in its variation that no deduction of any importance could be made and the data are submitted merely as a matter of record.

In the seeds of wheat, oats, barley, and corn, the percentage of crude fiber remained practically constant under the different irrigations, but in the straw of these crops the crude fiber content increased rather regularly and strongly with the increase of irrigation water. This general tendency was also very marked in the hay and fodder crops but it did not seem to obtain in sugar beets, carrots, potatoes, cabbage, and onions. From these results the general conclusion is drawn that the above-ground parts of plants, with the exception of the seeds and some specialized parts, tend to become more woody as more water is used, but that the underground parts are not influenced largely in the crude fiber content by the quantity of water used in irrigation.

The total yield of ash per acre in the kernels and straw of wheat, oats, barley, and corn showed a steady and large increase as the quantity of irrigation water increased, but it was found that the total yield of ash in the kernels did not increase to the same extent as that in the straw. All the other crops under investigation showed an increase in the total weight of ash per acre as the quantity of irrigation water was increased, but this increase in the case of the fodder crops was to some extent irregular.

A study of the total yield of protein per acre in the grain and straw of wheat, oats, barley, and corn showed that this factor was but little influenced as the quantity of irrigation water was increased. In sugar beets and carrots it increased appreciably and steadily and an increase was also recorded for cabbage and onions as the amount of water was increased. Potatoes showed only a slight increase with the increase of irrigation water.

Experiments were conducted with New Zealand wheat to determine whether a high-protein content induced by using small quantities of irrigation water could be made to persist under more humid conditions. While the data obtained

were not very extensive it is believed that they gave fair evidence that the high percentage of protein induced by low quantities of irrigation water does not persist in later generations when large quantities of water are used.

A study was also made of the starch and sugar in potatoes and sugar beets as affected by the quantity of irrigation water applied. It was found that when the sum of starch and sugar was considered there appeared clearly a tendency for the percentage of carbohydrates to increase as the total water increased, and sugar beets also showed a tendency to increase their sucrose content as more water was used up to about 35 in. The variation in sucrose content, however, was very small and not even approximately in proportion to the differences in water used. The application of 50 in. of water in every case decreased the sucrose content. The percentage of purity was lowest with the smallest quantity of water used and largest with intermediate applications up to 20 in.

The variations in plant composition resulting from differences in methods of cultivation and of irrigation were unimportant. The cultural tests indicated no difference in their effect upon the composition due to the different treatments, but noncultivated crops showed a rather strong tendency to contain a slightly higher percentage of protein than the cultivated crops. Wheat grown with different amounts of seed and seeded under different methods showed practically no difference in the composition of the crop.

The results of experiments on the distribution of irrigation water in growing wheat and oats indicated that the composition of wheat was most responsive to the distribution of irrigation water when the amount was small. When the greater part of the water was applied early in the season the percentage of protein was the highest. Irregularity in the applications also seemed to increase the protein content. When the distribution was such that the percentage of moisture remained constant throughout the growing season the percentage of protein fell and when the water was so applied that a high moisture period was followed by one of low moisture, the percentage of protein rose.

The results of milling tests previously noted (E. S. R., 20, p. 357) are reviewed and later results are reported. It was found that the weight per 100 kernels of irrigated wheat was greater than that of either spring or winter wheat grown under dry farming methods. The yield of flour, bran, and shorts showed nothing characteristic. The moisture content of the irrigated wheat was higher than that of the dry-farm wheat. The moisture content of the bran was practically the same as that of the wheat, and the moisture of the flour was about 2 per cent and that of the shorts 1 per cent higher than that of the wheat. The lowest protein content was found in the irrigated wheat. Wheat grown with 15 in. of water as compared with the wheat receiving 25 in. did not show any marked difference in the amount of protein in the berry, flour, bran, and shorts. The difference between the protein content of wheat receiving 25 in. of irrigation water and dry-farm spring wheat was 2.85 per cent, and of the flour produced from these wheats 3.11 per cent, of the shorts 2.77 per cent, and of the bran 1.42 per cent. Flour produced from dry-farm winter wheat had a slightly lower moisture content than that from the other kinds.

It is pointed out that these investigations, extending over a period of 8 years, show that the dry-farm grains in Utah are characterized by a low moisture content and a high protein content, and further that the protein content of the dry-farm wheats is higher than that of the wheat grown on irrigated farms.

Alfalfa cooperative experiments, W. P. Brooks and H. J. Baker (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 10–13*).—Notes are given on alfalfa tests conducted in 10 different counties to determine the possible success of growing

alfalfa in the State. Of these tests, 13 were successful, 9 partially so, and 7 were failures. The causes of the failures were winterkilling, excessively dry weather in the fall, and weeds and grasses. In the successful experiments, the yields ranged from 1½ to 6 tons per acre and the average yield of 14 experiments was 2½ tons per acre.

Types of corn suited to Massachusetts conditions, P. H. SMITH and J. B. LINDSEY (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 221–243; abs. in Massachusetts Sta. Rpt. 1911, pt. 2, pp. 14, 15*).—The results of experiments in progress since 1903 to determine the varieties or types of corn best suited to Massachusetts are reported. The total yield of dry matter per acre, digestibility, relative proportions, in some cases the composition of the stalk, leaf, ear, and husk, and the relation of stage of development to the relative proportion of different parts as affecting the food value were studied. The varieties tested were Twitchell, Early Flint, Sanford White, Longfellow, Pride of the North, Rustler Dent, Leaming. Brewer, Early Mastodon, Klondike, Red Cob Silage, White Cap Yellow, Wing Improved White Cap, and Eureka.

Most of these varieties showed the entire plant to consist of about 70 per cent of stalks and ears, 20 per cent of leaves, and 10 per cent of husks. The medium dent and flint varieties, including Pride of the North, Rustler Dent, Longfellow, and Sanford White averaged 33 per cent of stalk and 37 per cent of ears, and proved quite well suited for grain and fairly well for silage. The larger medium dent varieties, such as Leaming, White Cap Yellow, Brewer, and Early Mastodon. which in an average season bring their ears to the milk stage under Massachusetts conditions, yielded about 45 per cent of stalk and 26 per cent of ears and are considered rather preferable for silage purposes.

The several mature types gave an average of 15.5 per cent of cob and 84.5 per cent of kernel, while the average for the less mature varieties was 18.1 per cent cob and 81.9 per cent kernel. The grain showed only slight variations in composition and also little variation was noted in the composition of the corn cob. The net available energy in 100 lbs. of cob is given at 40.2 therms as against 85.5 therms in a like amount of corn meal. It is pointed out that on this basis the cob has 47 per cent of the value of the meal for feeding purposes.

Digestion coefficients reported previously (E. S. R., 18, p. 233; 19, p. 264) or on page 363 of this issue are summarized for most of the varieties. No wide variations were noted, the range being from 67 to 77 per cent.

[Complete analyses of corn], P. H. SMITH (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 16–20*).—Complete fodder analyses of 22 varieties of flint corn and 5 varieties of dent corn are reported, together with the relative proportions of kernels and cob. The data are believed to indicate that chemical composition is not an important factor in the selection of seed corn where the crop is used for the sustenance of live stock. In one sample the ears contained only 15.2 per cent of cob.

Ramie, L. H. DEWEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 103, pp. 9, figs. 2*).—A description of ramie as a plant and a crop, together with notes on the climatic and cultural requirements, and on the preparation of the fiber, its uses, and market value.

The American beet-sugar industry in 1910 and 1911, W. A. ORTON, W. B. CLARK ET AL. (*U. S. Dept Agr., Bur. Plant Indus. Bul. 260, pp. 9–30, 69–73, pls. 2, fig. 1*).—The work of the Bureau of Plant Industry on sugar beets is described with reference to projects and field stations, a general review of the beet-sugar industry in the United States is presented, and statistics on sugar-beet production, beet-sugar manufacture, and sugar production and consumption in general are compiled. In reviewing the beet-sugar industry in this country, climatic conditions are discussed with reference mainly to rainfall and length

of growing season, the progress of sugar-beet culture and beet-sugar production is described separately for each of the principal sugar-beet regions, California, the intermountain region, including Colorado, Utah, Idaho, and parts of western Kansas, and Nebraska, and the Great Lakes region, including northern and southern Michigan and Wisconsin and northern Ohio, Indiana, and Illinois, and isolated factories in different States are briefly noted. The advance made in the use of beet tops, pulp, molasses, lime, and waste water is pointed out and their approximate value for the year 1911–12 is estimated at $4,097,500.

An analysis of the cost of growing sugar beets in the 3 principal beet regions is presented in a table. In the Great Lakes section, the average cost of growing an acre of sugar beets is estimated at $35.50, in western Nebraska at $42.50, in western Colorado at $43.50, and in California at $31.90. Sugar production and consumption in the United States is discussed in relation to supplying the home demand, and in this connection it is stated that for this purpose less than 1 per cent of the available sugar-beet land would be required.

The statistics as given for the year 1911–12 show a total of 66 factories in operation with an average run of 94 days. Michigan led in the number of factories with 17, being followed by Colorado with 14, and California with 10. The area harvested is given at 473,877 acres, with an average yield of 10.68 short tons per acre and an average value of $5.50 per ton. The quantity of beets worked was 5,062,333 short tons, and the average sucrose content 15.89 per cent, of which 73.92 per cent was recovered in the process of manufacture. The quantity of sugar manufactured is estimated at 599,500 short tons.

The sugar beet in European agricultural economy, W. A. Orton (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 260, pp. 31–42*).—This article points out the significance of the European beet-sugar situation to the American industry, discusses European farm organization, and reviews the opinions of German authorities on the direct and indirect effects of beet culture on the productiveness of the soil. The average yields of crops in rotation with sugar beets on 115 American farms are reported in a table to show the influence of beet culture on succeeding crops, which in the case of each crop appears to have been favorable.

Relation of adaptation to the improvement of sugar-beet varieties for American conditions, F. J. Pritchard (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 260, pp. 43–48*).—Instances of adaptation are enumerated, methods of adaptation described, and the susceptibility of characters to the influence of external conditions, the inheritance of variations, and the relation of adaptation to production are discussed. The experiments cited in connection with the discussion are regarded as indicating the possibilites of improving the present European varieties of sugar beets for our local conditions by adaptation. The needs and prospects of producing sugar-beet seed on a commercial scale in this country are considered and it is pointed out that a truly American sugar-beet seed industry can be built up only by breeding varieties adapted to our conditions and by growing our own commercial seed.

Farm practice in the Arkansas Valley, Colorado, L. A. Moorhouse (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 260, pp. 49–60*).—This article describes the Arkansas Valley with reference to physical characters, climate, irrigation, soil types, types of farming, and methods of tillage and cropping, and gives directions for the culture of the sugar beet with a view to suggesting means for the improvement of the returns from the beet fields of the region.

Lost motion in the sugar-beet industry, H. B. Shaw (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 260, pp. 61–67, pls. 6*).—Inefficient methods and unprofitable management, as they are often observed in the sugar-beet industry, are pointed

out and discussed and means for improvement are suggested. As examples of lost motion are mentioned the loss of material and motion in the application of manure, inefficient blocking and thinning of the beets, insufficient weed control, especially along the banks of irrigation ditches, improper preparation of land for the best distribution of irrigation water, the use of too much hand labor in harvesting, and poor roads and badly constructed beet dumps as they affect marketing the crop.

Tobacco injury due to malnutrition or overfertilization, H. D. HASKINS (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 35–46*).—Experiments were conducted to determine the cause of certain peculiar conditions affecting the young tobacco plant usually soon after transplanting. Samples of soil were taken from portions of a field where this trouble was conspicuous, from other parts where the growth of the crop was normal, and from the tobacco bed which had furnished the plants for setting the field. Exact quantitative determination of nitrogen, potash, phosphoric acid, and lime were made using 1.115 specific gravity hydrochloric acid as a solvent. From the results which are reported in a table it was not possible to account for the trouble. The soil producing a normal plant showed a larger amount of nitrogen and phosphoric acid than 3 abnormal soils producing a stunted growth, and in one instance also a larger amount of potash and lime.

A second experiment was begun to determine whether any injurious effect to the growing plant might be due to the water-soluble portion of the various fertilizer constituents contained in the soil. It was found that the soils showing a normal growth of tobacco contained comparatively small amounts of total solids, nitrogen, potash, and of most all of the water-soluble constituents. The soils giving abnormal results showed an increase of over 70 per cent of total solids, over 85 per cent of water-soluble nitrogen, and over 219 per cent of water-soluble potash. The water-soluble nitrogen in one of these soils represented an application of 3,445 lbs. of nitrate of soda per acre, while the water-soluble potash found in another soil represented 1,112 lbs. of high-grade sulphate of potash per acre.

The field on which the abnormal growth of tobacco occurred was underlain with a hard impervious subsoil and had been used for the cultivation of tobacco continuously for more than 30 years. A further study was made of the soil to determine the degree of accumulation of soluble saline constituents. Samples of soil for this purpose were taken to a depth of 1 ft. and of the subsoil to a depth of 1 ft. below the surface soil. The results of the analysis of the different soils which are presented in tables indicated that the injurious effect, if due to the accumulation of plant food elements, must have resulted from the water-soluble salines present. The soluble matter in the normal soils was very much less than in the soils which had given trouble, although the normal soils had produced tobacco continuously for as many years and had been fertilized as liberally as the soils giving poor results. It is believed that the combined effect of the total mineral constituents of the soil is responsible for the injurious effect rather than an accumulation of any one of the soluble elements. Drainage and crop rotation are suggested as measures of possible relief.

Vetches, C. V. PIPER, R. MCKEE, and F. H. HILLMAN (*U. S. Dept. Agr., Farmers' Bul. 515, pp. 28, figs. 10*).—This bulletin gives complete directions for the culture of common and hairy vetch and points out the different uses of these crops. In addition brief descriptive notes are given of the following cultivated species: Bitter vetch (*Vicia ervilia*); scarlet vetch (*V. fulgens*); purple vetch (*V. atropurpurea*); Narbonne vetch (*V. narbonnensis*); narrow-leaved vetch (*V. angustifolia*); and woolly-podded vetch (*V. dasycarps*).

The results of germination tests of seeds of common vetch of different ages by E. Brown are given in a table and a discussion of vetch seed and its adulterants is appended.

Cropping systems for wheat production, J. H. SHEPPERD and R. C. DONEGHUE (*North Dakota Sta. Bul. 100, pp. 63, figs. 4*).—The results of 2 series of crop-rotation experiments, the first extending from 1892 to 1906 and the second from 1902 to 1911 and conducted to determine the influence of various crops on the yield of succeeding crops of wheat, are reported. In the first series, wheat was grown continuously and in 2, 3, 4, 5, 6, and 7-year rotations with 1 or more other crops, while in the second series the rotation was of 4 years' duration on all plats excepting the check plats, but some of the cropping systems were duplicates of those in the first series.

The rotation plats in the first series yielded on an average for the entire period 5.99 bu. of wheat more per acre than those on which wheat was grown every year. During the first 5-year period there was an increase of 1.51 bu., during the second of 4 bu., and during the third of 12.46 bu. per acre on the plats under rotation. The average yield of wheat for all plats was 19.02 bu. for the first 4-year period, 20.04 bu. for the second 4-year period, 20.78 bu. for the third 4-year period, and 15.23 bu. for the last 3-year period. Excessive rainfall and drought reduced the yield materially in some years. The yield of wheat was increased when it was preceded by corn, potatoes, mangels, rape, German millet, broom corn, or hog millet, field peas, medium red clover, and timothy, but when the crop followed oats, barley, spring rye, or flax, the yield was practically the same as on the plats growing wheat continuously. It was observed that the first wheat crop after a cultivated crop sometimes had a high proportion of straw, usually soft in texture and subject to attacks of rust. In dry seasons, there was little increase in the yield of wheat on timothy or clover sod, but there was a marked increase in the second and third crop of wheat following. A cultivated crop or a leguminous or grass crop grown on the land in immediately preceding years increased the yield of wheat but the best yields were obtained when the rotation contained both a cultivated crop and a leguminous or grass crop. All crops, except spring rye and oats, help to keep the weeds in wheat fields in check and the beneficial effects of crop rotation were most marked in a good crop year or in a dry year.

The largest total income per acre was derived from the cropping system in which corn was manured one year and followed by wheat 3 years. The second in rank was the same rotation with no manure applied to the corn crop, and the third one in which millet was grown with manure and followed by wheat 3 years. The largest income derived from wheat was secured in the 4-year rotation, including a crop of millet receiving manure. This was followed by the 4-year rotation including a manured corn crop, a 4-year rotation including manured fallow 1 year, and a 4-year rotation including a corn crop without manure.

In the second series the highest average yield of wheat was produced in the 4-year rotation containing German millet, the rotations of corn 1 year and wheat 3 years and fallow 1 year and wheat 3 years ranking second and third. The highest average annual income was derived when the cropping system was potatoes 1 year and wheat 3 years, with corn 1 year and wheat 3 years and flax 1 year and wheat 3 years ranking second and third. The yield of wheat the first year after drilled corn was less than on continuous wheat land, but the average of the second and third crops was practically the same as when the preceding corn crop was planted in rows and cultivated.

Barnyard manure applied to corn in rotation with wheat brought about an increase amounting to $1.07 per load, and when applied to millet in rotation

with wheat of $1.04 per load, as based on the prices for the years in which the crops were produced. The beneficial effects of manure were evidenced in the marked increase in the wheat yield due to manuring as the years advanced. Green manures failed to produce an increase in the yield in the first 2 courses of a 4-year rotation, but a marked increase occurred in the third and fourth courses. Field peas as green manure produced a greater increase than millet. From 2 to 3 lbs. of medium red clover seeded with wheat apparently increased the yield per acre by 1.81 bu.

Seed work for the year 1911, G. E. Stone (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 102–107*).—Tables are given showing the records of seed germination for 355 samples and of seed separation for 135 samples, aggregating 6,320 lbs. in weight. In addition to this work in 1911, 68 samples were tested for purity. Tables are also given summarizing the seed work of the station since 1899. The growth of this work and its importance are discussed.

Digest and copy of seed law, J. G. Lipman (*New Jersey Stas. Circ. 12, pp. 3*).—This circular presents the text of the New Jersey seed law passed March 26, 1912, which provides for the employment of a seed analyst by the station.

HORTICULTURE.

[Report of the] asparagus substation, Concord, W. P. Brooks (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 25–28*).—The work at the substation was continued along the lines previously noted (E. S. R., 26, p. 44). In the rust-resistant breeding experiments, which are being conducted by J. B. Norton, a number of rust-resistant types have been produced and are to be propagated for further trial.

Although the fertilizer experiments have not been completed as yet, a study of the reported yields and observations indicates that nitrate of soda used up to the rate of 466 lbs. per acre proved beneficial when used either in combination with acid phosphate and muriate of potash or with stable manure. Larger applications of nitrate of soda have given no added benefit. Nitrate of soda has been applied according to 3 distinct plans, namely, all applied in early spring; one-half applied in early spring and the balance at the close of the cutting season; and all at the close of the cutting season. The variation in the season of application gave no well-defined difference in yield, but the amount of rust has appeared to be less with the larger applications applied at least in part after the cutting season. Nitrate of soda applied in such liberal quantities as to promote a continuous vigorous growth of the plant after the close of the cutting season seems to increase the capacity of the plants to resist rust.

A number of different materials were used as the source of potash, but a plat receiving kainit showed the least amount of rust. It is suggested that this may have been due to the fact that the kainit plat was located at the greatest distance from the chief source of rust infection.

Acid phosphate used in combination with nitrate of soda and muriate of potash gave a considerable increase in crop, the maximum increase being secured with 188.7 lbs. of acid phosphate per acre. Muriate of potash used in combination likewise increased the crop, but an increase in the quantity of muriate above the rate of 260 lbs. per acre gave no further benefit.

Witloof culture, P. de Backer (*De Teelt van Witloof. Thielt, Belgium [1911], pp. 23*).—A popular treatise on the culture of witloof.

Truck growing in North Carolina, W. N. Hutt, S. B. Shaw, and O. M. Clark (*Bul. N. C. Dept. Agr., 33 (1912), No. 9, pp. 40*).—A popular treatise on

the culture of the more common vegetables, including notes on varieties adapted to North Carolina conditions.

A report on the knowledge of the periodicity and annual ring formation of deciduous trees and shrubs, H. L. SPÄTH (*Der Johannistrieb. Ein Beitrag zur Kenntnis der Periodizität und Jahresringbildung sommergrüner Holzgewächse. Berlin, 1912, pp. XII+91, pls. 8, figs. 13*).—A review of the literature, together with a detailed report of the author's biological, physiological, and anatomical studies of second growth phenomena. Observations were made of the occurrence and nature of second growth phenomena among trees and shrubs in central Europe, experiments were conducted to determine the influence of various external factors on growth performance and to establish a basis for distinguishing abnormal growth from normal growth, and an anatomical study was made of the effect of secondary shoot formation on wood structure. A bibliography is included.

As a result of his investigations the author recognizes the three following classes of secondary shoots: Sylleptic shoots, "Johannistriebe,"[a] and proleptic shoots.

Sylleptic shoots consist of lateral shoots which develop in regular arrangement, but unexpectedly and regardless of either time of year or external influences on an unrestricted main shoot during the continued growth of the terminal bud. They usually develop without previously forming bud scales and consequently without going through a rest period. They belong to the normal growth system of plants but occur most frequently on young plants.

Plants which form Johannistriebe (literally John shoots, with reference to the time of St. John's day) are characterized by more or less repeated alternate periods of rapid development and apparently absolute rest in the length growth of the branches during the summer growing season. As with sylleptic shoots, John shoots are classed in the normal growth system of plants but, unlike sylleptic shoots, they appear regularly on older plants.

Proleptic shoots comprise those shoots which develop irregularly and without regard to time of year on an unrestricted main shoot which has completed its length growth and on which the terminal bud at least has passed through a distinct rest period. Proleptic shoots are common to all deciduous trees and shrubs and are induced by abnormal growth conditions.

The author's anatomical studies show that neither sylleptic shoots nor John shoots cause any changes in wood structure, whereas proleptic shoots do tend to develop false annual rings which are very similar to but never completely resemble normal annual rings.

Electrical resistance of trees, G. E. STONE and G. H. CHAPMAN (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 144–176, figs. 3*).—In continuation of previous studies dealing with injuries to shade trees from electricity (E. S. R., 15, p. 370) a number of determinations were made of the electrical resistance of trees exposed differently to light and heat, together with the electrical resistance of different tissues and the relation of electrical resistance to sap flow. Some experiments were also made with pot-grown tobacco plants.

Summarizing the results as a whole, the authors find that the electrical resistance of trees shows a close relationship to both daily and seasonal temperature, their higher resistance corresponding with the low temperature and the low resistance corresponding with the higher temperature. Electrical resistance is usually less during afternoons than mornings. The average electrical resistance of trees is highest on the north side, followed by the west, south, and

[a] The English equivalent for this term is given as "Lammas shoots;" see Ward's Trees, Vol. I (E. S. R., 17, p. 255).

east sides, respectively. The temperature of trees coincided in a general way with the variation in the resistance of the different sides of the tree. The difference in the average electrical resistance of north and south sides of the tree is about 5 per cent, the average difference in the temperature being about the same. The average electrical resistance for the east side of the tree is about 8 per cent lower than the west side.

As indicated by records of lightning discharges and by the present experiments, the cambium layer appears to offer the least electrical resistance. This is followed by the phloem and sapwood. Small plants and branches of trees in general gave higher electrical resistance than trees, probably due to the greater amount of conductive tissue possessing less resistant qualities in the trees. Sap flow did not appear to exert any influence on the electrical resistance.

The authors conclude that the high resistance and consequent nonconductivity of trees serve as a protection for the tree against lightning stroke and other electrical discharges. Whereas temperature constitutes a determinative factor in variations of electrical resistance of trees, other meteorological factors, such as relative humidity, barometric pressure, winds, etc., appear to exert no discernible specific influence.

Coarse nozzle versus mist nozzle spraying, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 56–59*).—A discussion of the relative merits of high-pressure coarse nozzle spraying and low-pressure fine mist spraying. In view of the results secured by the Massachusetts Gipsy Moth Commission and others with high-pressure coarse nozzles, the author concludes that by the use of nozzles adapted to high pressure machines which can be adjusted to different distances, the spraying of orchards can be done as effectively and more cheaply than at present.

The first season with the peach orchard, M. A. BLAKE (*New Jersey Stas. Circ. 14, pp. 31, pls. 10*).—This is a somewhat revised edition of Bulletin 219 previously noted (E. S. R., 20, p. 1037).

[Report of the] cranberry substation, W. P. BROOKS (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 14–17, 19, 22–25*).—A progress report on the construction of the station's experimental cranberry bog at East Wareham, Mass., together with a summary of the experimental work conducted in 1910 and in 1911.

The fertilizer experiments at the station's Red Brook bog at Waquoit (E. S. R., 24, p. 239) were discontinued since certain natural inequalities in soil tended to reduce the value of the results.

The investigations conducted in 1911 are here outlined under the following general headings: Insects, fungus diseases, weather observations, fertilization of cranberry blossoms, prolificness of varieties, and application of the Skinner irrigation system to the needs of the cranberry industry. Another summary of this work has been previously noted (E. S. R., 26, pp. 840, 857).

The diameter growth of palms, J. C. SCHOUTE (*Ann. Jard. Bot. Buitenzorg, 2. ser., 11 (1912), pt. 1, pp. 209, pls. 15, figs. 77*).—A study of the growth performance of various species of palms, based upon comparative diameter measurements of different aged plants growing at Buitenzorg, together with an anatomical study of the material.

The cultivation of tea in Natal, E. R. SAWER (In *Cedara Memoirs on South African Agriculture. Pietermaritzburg, 1912, vol. 3, pp. 143–164, pls. 6*).—A report on tea culture in Natal, discussed under the general headings of the nature and value of Natal teas, tea soils in Natal, cultivation, manufacturing, and firing. Introductory considerations deal with the history of tea culture in Natal.

Walnut culture in California.—Walnut blight, R. E. and C. O. SMITH, and H. J. RAMSEY (*California Sta. Bul. 231, pp. 119–398, figs. 96*).—This is a treatise on the culture of the English walnut (*Juglans regia*). The subject matter represents the results of an investigation started in 1905 primarily to determine a remedy for walnut blight but which has been extended from time to time to include practically all phases of walnut culture in California.

The species of Juglans are considered with reference to their important characteristics, relationships, and distribution, especial attention being given to the species, types, and hybrid forms occurring in California. Briefer notes deal with other native and foreign species. A study of the native American species of walnut indicates that they present a unique example of freedom in hybridization and variation when grown in California.

The walnut industry in California is discussed with reference to its history, climatic and soil requirements, planting distances, cultural operations, crop handling, packing house operations, and propagation, including a discussion of root-stocks for different localities, and nursery practices.

The important commercial varieties are described at length and briefer notes deal with miscellaneous and less prominent varieties. A detailed account of diseases affecting the walnut is noted on page 349 of this issue. A few important insect pests are also considered.

Some excerpts from a translation of an article on walnut varieties in France, by F. Lesourd,[a] are appended.

Ornamental cacti: Their culture and decorative value, C. H. THOMPSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 262, pp. 24, pls. 18*).—Although this bulletin may be of interest to cactus fanciers generally, it deals more particularly with the ornamental utilization of the cacti in the warmer and drier southwestern regions of the United States. The subject matter is discussed under the general headings of propagation of cacti from seeds, vegetative propagation, grafting, culture, diseases, insect pests, economic value of cacti, decorative value of cacti, and cultivated forms of cacti.

Experiments with rose soils, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 60–68*).—Some greenhouse experiments conducted through 2 seasons to determine the effects of different soil textures on the growth of roses are reported. Data are also given showing a mechanical analysis of some of the best rose soils obtainable from the rose houses of the eastern United States.

In these experiments the soils which produced the most normal growth were those of a compact nature, and the freshly prepared soils gave better results than the old soils which had been used for growing various crops. The best rose soils appear to be those which possess from 8 to 12 per cent or more of clay, and which are well supplied with other grades of the finer particles. There should be over 75 per cent of very fine sand, silt, and clay.

Making the grounds attractive with shrubbery, GRACE TABOR (*New York, 1912, pp. 53, pls. 7, figs. 6*).—A brief popular treatise discussing the selection, grouping, planting, and general care of shrubbery, including also select and comparative lists of shrubs.

FORESTRY.

The forester's manual, E. T. SETON (*Garden City, N. Y., 1912, pp. X+141, figs. 237*).—This comprises a popular descriptive account of 100 of the best known native timber trees of northeastern America, including the identification of the tree, its habitat, properties, uses, and various interesting facts about it.

[a] Rev. Hort. [Paris], 83 (1911), Nos. 13 pp. 310–314; 14, pp. 329–332; 15, pp. 358–360; 16, pp. 378–380, figs. 24.

The art of the second growth or American silviculture, C. A. SCHENK (*Albany, N. Y., 1912, 3. rev. ed., pp. 206*).—The purpose of the present work is to serve as a handbook useful to the forester working in a second growth or for a second growth anywhere in America. The successive chapters deal with the foundations of silviculture, the seed forest, the sprout forest, the composite forest, and the propagation of forest products other than wood and timber.

Forest conditions of Nova Scotia, B. E. FERNOW (*Ottawa, 1912, pp. XI+93+5, pls. 18*).—This report is based on information gathered from a reconnoissance forest survey of Nova Scotia conducted under the direction of the author.

In part 1, under the general heading Forest Conditions of Nova Scotia, the object and aim of the reconnoissance, method of survey, and physiographical features of the Province are discussed, the species of forest trees occurring in Nova Scotia are enumerated, and the statistical results of the survey are given, together with recommendations relative to the improvement of forest conditions. Part 2 deals with the distribution and reproduction of the forests in relation to the underlying rocks and soils on the Atlantic slope, the Northumberland and Minas drainage basins, and burned areas. A number of maps showing the forest distribution and the geologic formation of Nova Scotia are appended.

General report on the forests of the easily accessible districts of the colony [British Guiana], C. W. ANDERSON (*Georgetown, Demerara: Dept. of Lands and Mines, 1912, pp. 55, pl. 1*).—Introductory considerations deal with the geography, topography, and physical features of British Guiana. Consideration is then given to the forests relative to their area, distribution, and vegetation; situations and general characteristics of the forests of the swamp lands; general characteristics of the forests of the slightly elevated or hilly country; woods and forest products most commonly used; balata tree forests; latex producing forest trees; and the inspection of the forests.

The forests of the Philippines, H. N. WHITFORD ([*Philippine*] *Bur. Forestry Bul. 10, 1911, pts. 1, pp. 94, pls. 29; 2, pp. 113, pls. 103; abs. in Forestry Quart., 10 (1912), No. 4, pp. 571–601, pl. 1*).—Part 1 of this bulletin, which deals with forest types and products, is discussed under the following general headings: Classes of vegetation, wood uses, weight and hardness, lumbering in the Philippines, minor forest products, and relation of the government to the forests and their products. Data on mechanical tests of 34 Philippine woods, together with a bibliography of the forests and forest products of the Philippines are appended. Part 2 contains popular descriptions of 106 commercial timber trees, together with briefer mention of some 277 other trees found commonly in the forests or cultivated for ornamentals or for fruit.

Silviculture in the Tropics, A. F. BROUN (*London, 1912, pp. XVIII+309, figs. 96*).—This treatise is divided into 4 general parts, which discuss the factors governing and influencing the existence of forests, formation and regeneration of forests, training and improvement of forest crops, and special measures of maintenance and protection.

Statistics relating to forest administration in British India, 1910–11 (*Statis. Forest Admin. Brit. India, 1910–11, pp. 27, pl. 1*).—A statistical review of forest operations in British India in 1910–11. The data given show alterations in forest areas, progress in forest settlements, working plans and surveys, forest protection work, etc., together with yields and revenues from major and minor forest products, and a financial summary for the past 25 years. Statistical diagrams indicating some results of forest administration in British India are appended.

Progress report of the Forest Research Institute for 1911–12, L. MERCER (*Rpt. Forest Research Inst. [Dehra Dun], 1911–12, pp. 28*).—In addition to a progress report on investigations in silviculture, forest botany, forest economy, forest zoology, and forest chemistry, a list is given of all forest publications issued since the establishment of the Forest Research Institute, together with a tabular summary of investigations being conducted by various branches of the institute and a financial statement for the year.

Some observations on the growth of elm trees, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 72–74*).—Measurements were made of 2 rows of elm trees running north and south and growing in soils of similar texture. On one side of the road the trees have been in mowing land for about 32 years and on the other side they have been growing in lawn conditions for the same period.

The rate of growth of the trees growing on the lawn side of the road was 9 per cent greater than those on the mowing side. In another case where the roadway is wider, the difference was 36 per cent in favor of the trees on the lawn for a period of 22 years. It is suggested that these trees may show the effects of occasional applications of fertilizers to the lawn. The difference between lawn and mowing conditions is more prominent in dry than in moist soils.

A comparison was made between 2 rows of elms on either side of a wide highway, one row growing in well-drained soil and the other in wet soil. Drainage appears to have increased the growth of the trees about 10 per cent for a 30-year period. Exposure to light appears materially to affect the growth of trees. In one case there was a difference of 11 per cent in favor of the south or sunny side of a row of elms.

Reproduction by layering in the balsam fir and other conifers, W. S. COOPER (*Abs. in Trans. Ill. Acad. Sci., 4 (1911), p. 132*).—This abstract states in brief that during ecological studies on Isle Royale, Lake Superior, balsams were found which were producing young trees by the layering of the lower branches. The habit was also observed, though less commonly, in all the other coniferous species growing on Isle Royale.

The production of maple sirup and sugar, A. H. BRYAN and W. F. HUBBARD (*U. S. Dept. Agr., Farmers' Bul. 516, pp. 46, figs. 12*).—A popular treatise on the production of maple sirup and sugar, comprising as a whole the more practical results of a chemical study of pure maple sirup and maple sugar, the first technical paper on which is noted (E. S. R., 24, p. 266), together with the essential parts of Forest Service Bulletin 59 (E. S. R., 17, p. 774) and Farmers' Bulletin 252 (E. S. R., 17, p. 1098), which bulletins it supersedes.

Consideration is given to the geographic distribution of sugar maples and the silvical requirements and management of sugar groves, together with a detailed account of the methods and apparatus employed in the collection of sap and the manufacture of maple sirup and sugar. A number of economic considerations dealing with the industry are discussed and the publication concludes with statistics of the maple sugar and sirup industry of the United States.

Increasing the durability of fence posts, F. W. BESLEY (*Maryland Sta. Bul. 163, pp. 243–262, figs. 19*).—The first part of this bulletin describes experiments in the preservative treatment of fence posts started at the station in 1888 and terminated 20 years later. The posts used in this work were of seasoned red cedar and of green sawed chestnut.

The condition of the posts at the end of the 20-year period indicated plainly that creosote is more efficient as a preservative than either coal tar or crude petroleum. It was concluded in a general way that applying the preservative with a brush is not very effective, that charring the part of the post which is

to be placed underground does not add to its durability, and that filling in around the post with stones or brickbats does not increase its durability.

The second part of this bulletin describes a new line of experiments with fence posts undertaken in cooperation with the Forest Service of the U. S. Department of Agriculture in the spring of 1909. About 1,000 posts of a number of different species were treated by the open tank process. Data are given on rate of seasoning, oil penetration, and cost of treatment for different species, together with the results shown at the end of the first 2 years. None of the posts treated with creosote, tar, or petroleum showed any perceptible decay after 2 years' use, whereas a large number of the untreated posts of the same size and same kind of wood were decayed to such an extent as to be unserviceable. The relative durability of the different woods showing serious decay at the end of the 2 years is as follows, beginning with the most durable: Locust, chestnut, spruce pine, beech, maple, pin oak, birch, sweet gum, white poplar, yellow poplar, black gum, and sycamore.

DISEASES OF PLANTS.

Fungoid diseases of agricultural plants, J. Eriksson, trans. by Anna Molander (*London, 1912, pp. XV+208, figs. 117*).—This is a popular treatise on the diseases that attack agricultural crops in northern Europe, about 200 being included. Notes are also given on a number of diseases of allied crops in other countries, and the available means for combating or preventing the diseases are described. In the body of the work the diseases are grouped according to the systematic relation of the parasites, while in an appendix the diseases are grouped according to the host plants and the portions attacked.

Annual report on plant diseases, M. Hollrung (*Jahresber. Pflanzenkrank., 13 (1910), pp. VIII+469*).—This report, which was published in 1912, reviews the principal literature relating to plant diseases, insect pests, and methods for control. The literature is mainly that of 1910, nearly 2,000 articles being referred to either by title or abstract.

Diseases more or less common during the year, G. E. Stone (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 78–81*).—Brief notes are given on a number of diseases that were observed during the season of 1911, some of which have apparently not been previously noted. Among these is a new disease of tomatoes characterized by bacterial infection of the leaves; a stunted growth of dahlias which seems to have been due to some abnormal feature causing slow, stunted growth; a peculiar malnutrition of corn; and a fruit spot of apples, which had commonly associated with it a fungus belonging to the genus Cylindrosporium.

The chestnut bark disease is said to have spread to a considerable extent throughout the Connecticut Valley, and preventive measures for its control are believed to be well-nigh hopeless. Attention is called, however, to other injuries of the chestnut tree which are not in any way associated with the fungus causing this blight.

The author states that many of the shade trees, particularly the elms, of the State are dying from a number of causes, and on this account he advises that they should not be planted as shade trees but that the red oak should be substituted in their place.

Wintering of rust fungi in Bohemia, E. Baudyš (*Zemedělský Arch. (Arch. Bodenkult. Böhmen), 1911, p. 13; abs. in Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 10–13, p. 286*).—The author found that uredospores of the more important grain rusts, as *Puccinia dispersa*, *P. glumarum*, and *P. lolii*, can survive a moderate winter, such as that of 1910–11 in Bohemia, and that they are able to germinate early and may in this way produce an early and serious epidemic

of rust. Uredospores of *P. dispersa* retained their germinability in a dry room for 100 days.

Plant diseases induced by Sclerotinia perplexa n. sp., W. H. LAWRENCE (*Washington Sta. Bul. 107, pp. 22, figs. 9*).—The author reports observing considerable damage done to cultivated plants in western Washington, a prominent feature of the disease being root rot. The studies indicated that it was due to the fungus *S. perplexa* n. sp., and Jerusalem artichoke, onions, rutabagas, cucumbers, chicory, mangel-wurzels, kohl-rabi, cabbage, marrow cabbage, thousand-headed kale, and sunflowers are all reported subject to attack.

The nature of the injury on a number of these crops is described, particular attention being given to the development of the fungus on the sunflower. The rate of growth and development of the fungus on the stems and other parts of plants are described and the results of inoculation experiments given showing that the same fungus produces trouble on a number of the plants indicated.

A technical description is given of the fungus, and its development in culture media is described.

[Oat diseases and their control], K. STÖRMER and R. KLEINE (*Deut. Landw. Presse, 39 (1912), No. 51, pp. 599–601, figs. 4*).—The authors discuss the life history of nematodes, their effects on oats, and plans for lessening this damage, chiefly by means of manures based on potash; the control of dry spot on oats by spraying with 20 per cent iron sulphate to the amount of about 150 liters per acre; and the causation of mildew on grains by *Erysiphe graminis* and its control by use of phosphorus, potassium, and calcium salts.

Wilt of the black-eye bean, R. S. VAILE (*Mo. Bul. Com. Hort. Cal., 1 (1912), No. 12, pp. 912, 913, fig. 1*).—A description is given of the cowpea wilt due to *Fusarium vasinfectum*, which, it is said, has become of considerable economic importance on the black-eye beans or cowpeas in Ventura County, Cal.

Potato spraying, G. QUINN and R. FOWLER (*Jour. Dept. Agr. So. Aust., 16 (1912), No. 3, pp. 264–268*).—An account is given of spraying experiments carried on in 4 localities in which 4 acres each were sprayed and 2 acres left for checks in each series. The plants were sprayed with Bordeaux (3 sprayings) or Burgundy mixture at a cost per acre of $3.25 and $3.85, respectively. The net gain resulting from the sprayings varied from $8.00 to $23.75 per acre.

Sugar-beet diseases, 1911, O. FALADA (*Osterr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 1, pp. 16–28; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–24, p. 536*).—In this report the author mentions the somewhat successful employment of caustic lime and alkalis in destroying the larvæ of *Heterodera schachtii*, also the fact that a new fungus parasite of the sugar beet had been discovered by B. Němec to which the name *Sorolpidium betæ* has been given (E. S. R. 25, p. 145). Some insect pests also are discussed, as is the connection of the unfavorable weather with the various injuries observed.

Sugar-beet diseases in Bohemia, H. UZEL (*Ztschr. Zuckerindus. Böhmen, 36 (1912), No. 11, pp. 625–632*).—In investigations made in 1910, seed beets sent in for examination were found to be attacked by *Heterodera schachtii*. Infected refuse from the sugar works was found to be rendered measurably safe for use as fertilizer by thorough drying. In beets affected with root rot, only bacteria were found. In those showing black rot, the affected portions were filled with bacteria.

Collar rot, found in the vicinity of Kopidlno, was studied and is discussed at some length. The roots show from one to three constrictions some centimeters in width, dark, and scurfy, showing furrows, wrinkles, cracks, depressions more or less circular, and warts or warty pads. The constriction is ascribed to early checking of growth in that region by attacks of bacteria favored by injuries due to certain worms (Enchytræus) present in the soil.

and is also favored by damp weather and certain forms of manure, usually of an alkaline nature. The author recommends avoidance of such manures, drainage of soil, and exclusion of all diseased beets from contact with sound roots. The progress of several rusts of small grains is also recorded.

Chemical treatment of soils for gummosis, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 1, pp. 1–11*).—This is an account of experiments in treating tobacco-seed beds on soils containing slime bacteria with bisulphid of carbon, formalin, and permanganate of potash. The results, which were variable, are tabulated and discussed in detail.

It is stated that on infected ground the tobacco sets became diseased in spite of disinfection of both plants and water used for irrigation; that infection occurs most readily on the leaves; and that whatever advantages appeared as to freedom from disease and growth were in favor of the disinfection of both plants and beds. See also previous notes (E. S. R., 25, p. 654; 27, p. 650).

Crown rot of fruit trees: Field studies, J. G. GROSSENBACHER (*New York State Sta. Tech. Bul. 23, pp. 59, pls. 23*).—Since the publication of a summary of the literature relating to the crown rot (E. S. R., 22, p. 650), the author has devoted considerable of his time to field studies of this disease. These studies, which were pursued from 1909 to 1912, have shown that in the winter the bark on the trunks of fruit and other trees is often loosened or injured near or below the surface of the ground, and that the most severely affected portions of bark die during the subsequent vegetative season, often giving rise to crown rot. Similar bark injuries on the trunk and limbs result in cankered areas or the death of the affected bark.

Neither the factors which induce the initial bark injury nor those causing the subsequent death and decay have been determined experimentally, but from the field observations and data at hand the author concludes that the initial injuries are due to "(1) an unusually large increase in the diameter of tree trunks during a vegetative season, necessitating an enormous increase in the area of the bark and resulting in high bark tension toward the end of the growing period, or the premature cessation in the process of differentiation of bark tissues owing to some adverse condition of the environment; (2) low temperature and the resulting contraction of the bark with a consequent increase of bark tension; and (3) a wind-exposed location so that the bark at the crown or other places of bending of tree trunks or branches is subjected to great strain and consequent excessive evaporation during strong winds."

These conditions are held to result in loosening or injuring patches of bark, especially on the windward side of trunks and branches of trees which enter the dormant season with uncompleted bark growth or with high bark tension in regions of bending and strain. The death of the bark seems to be due to isolation and drying out, and is immediately followed by the entrance of bark fungi, like Sphæropsis and Cytospora. The wood is often discolored by the infiltration of substances, giving rise to what is called black heart, and often the stained wood is invaded by fungi, resulting in heart rot. The different varieties of apple trees sometimes showed marked variation in their relative susceptibility to the initial injury, but once injured they seemed equally subject to the rotting of the dying parts.

This trouble is said to entail considerable loss among fruit growers in wind-exposed regions. It is thought probable that the injury could be reduced by inducing early and moderate growth in young trees, and by providing windbreaks or some device to keep the trees from swaying in the wind during winter. Young trees should be carefully inspected in the spring for evidences

of loosened or cracked bark, all injured bark cut away, and the exposed wood covered with grafting wax or some tar paint.

Silver leaf disease of fruit trees, H. T. Güssow (*Ztschr. Pflanzenkrank., 22 (1912), No. 7, pp. 385–401, fig. 1*).—Reporting more fully on silver leaf or silver blight of fruit trees (E. S. R., 26, p. 749), the author states that inoculation experiments leave no room for doubt that this disease is caused by *Stereum purpureum* which seems to be a typical wound parasite, eventually killing the trees when once infected. It is further stated that the dead stumps and the adjacent soil have been found to contain abundant mycelium suspected to be that of the fungus in question.

No specific means of control have yet been worked out. Removal and burning of all trees or parts of trees infected; care in management of trees so as to avoid injury to the bark; avoidance of use of such infected trees for posts, etc.; and refusal of all suspected nursery stock are among the recommendations made for protection against this disease.

Fungicides in the apple orchard, C. Brooks (*New Hampshire Sta. Bul. 161, pp. 15*).—This bulletin gives a summary of 5 years' spraying experiments in the apple orchards of New Hampshire, the work being carried out for the control of particular diseases and the action of different fungicides being tested.

No fungicide was found to hold the diseases in check as well as Bordeaux mixture. When showers follow soon after an application of Bordeaux mixture the leaves are likely to be spotted and the fruit russeted by the fungicide, but this injury is seldom of sufficient importance to be detrimental except in the case of extra fancy fruit. No commercial form of Bordeaux mixture was found as satisfactory as the home-made article, and many of the mixtures on the market proved practically worthless. For the apple orchard a 3:3:50 solution is recommended.

Lime sulphur in most cases proved a satisfactory substitute for Bordeaux mixture. It caused little or no injury and in some seasons controlled the diseases as well as the copper fungicide. When diseases are serious and the season is a rainy one, more applications of lime sulphur will be required than of Bordeaux mixture. The self-boiled lime sulphur has given good results for the prevention of leaf spot, but in most cases has not held other diseases in check as well as Bordeaux mixture and commercial lime sulphur. It is said that the value of the lime sulphur will vary greatly with the quality of the lime used and the care in making the solution.

The iron-sulphid mixture gave promising results the one season that it was used, and is believed to be worthy of further trial.

Apples of the Baldwin variety are believed to be more susceptible to spray injury than those of the variety McIntosh.

Bluestem of the black raspberry, W. H. Lawrence (*Washington Sta. Bul. 108, pp. 30, figs. 28*).—The author states that during the period from 1904 to 1907 there was considerable complaint in western Washington of the failure of black raspberries to mature or of the death of the canes before harvest. A study was begun, and inoculation experiments proved that the trouble was due to a fungus to which the name *Acrostolagmus caulophagus* n. sp. is given. The characteristics of the disease on the different parts of the plant are described, from which it appears that the canes, fruit, leaves, and roots are all subject to attack.

The bulletin concludes with a description of the characters of the fungus grown on various culture media.

Control of American gooseberry mildew in Hungary, D. Hegyi (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, p. 1235*).—This is a discussion of the author's attempts at control of American

gooseberry mildew due to *Sphæotheca mors-uvæ*, which has been a source of injury in Hungary since its appearance there in 1907.

Tests with sulphur did not prove this remedy to be satisfactory. The best results were obtained with Bordeaux mixture. This is to be used on the plants in 5 per cent strength about March 1 and again before the buds break; again in 3 per cent concentration before flowering; and once or twice more in 5 per cent strength when the leaves are fully developed.

Experiments with lime sulphur were also made and a report on the results will appear later.

Notes on the invasion of mildew in 1912, J. DE GIRARD (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 43, pp. 517, 518*).—The author briefly describes a severe attack of downy mildew on grapes in Mèze in 1912. The principal attack was noted on June 17 and vines that had been sprayed more than 15 days prior to that time were badly infected, fully two-thirds of the crop being destroyed. Single sprayings made from 7 to 10 days before the period when the fungus made its appearance gave almost total immunity, while 3 applications made considerably earlier were without any special benefit.

[Soil in relation to roncet], E. PANTANELLI (*Staz. Sper. Agr. Ital., 45 (1912), No. 4, pp. 249–301; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 6, pp. 1445, 1446*).—The author announces as the result of his investigations regarding the occurrence of roncet that this disease seems to attack first the vines where the soil is rather fine and poorly drained, as this results in compactness, insufficient aeration, and difficult drying in the stratum penetrated by the deepest roots, which are those formed in the first years after planting. A bibliography is added.

Banana disease in Costa Rico, J. E. VAN DER LAAT (*Bol. Fomento [Costa Rica], 1 (1911), No. 6, pp. 394–398, fig. 1; abs. in Riv. Patol. Veg., 5 (1911), No. 11, pp. 173, 174*).—The author states as the result of his examinations made on bananas the productivity of which was much lowered by disease that this condition is not due alone or chiefly to *Fusarium cubensis* but to one or more of several physiological or other causes, the most important of these being acidity of the soil, fermentations in new tropical soils, want of soil drainage and aeration, lack of care in selection, failure of activity of certain bacteria, the presence of toxins due to abundant growth of the plants, and a faulty proportion of nutritive elements. Rigidly hygienic conditions are insisted upon for the plants, also treatment suited to particular cases.

Diseases affecting the walnut, R. E. and C. O. SMITH, and H. J. RAMSEY (*California Sta. Bul. 231, pp. 320–383, figs. 19*).—An account is presented of investigations on a number of diseases of walnut, a preliminary note on which has been previously given (E. S. R., 28, p. 154). The diseases described are blight or bacteriosis, die-back, sunburn, perforation, crown gall, root rot, seedling root rot or wilt, little leaf, and shriveled meat.

The bacteriosis, which is due to *Pseudomonas juglandis*, is described at considerable length. The history of the disease in California, losses, distribution, methods of attack, influence of climate, etc., are given, after which an account is presented of a technical study of the organism causing the disease. Attention has been frequently called to the marked similarity between the organism causing the walnut bacteriosis and *P. campestris*, which attacks cabbage and other cruciferous plants, but the author states that while the general characters of the two are very similar, the pathological properties are quite distinct. Experiments on the control of the disease by spraying were carried on in 1906 and 1907, but the total result obtained was such that this method is not believed to be an economical one. The difference in susceptibility to disease of different trees has long been noted, and it is thought that probably

through the use of immune varieties the disease may be combated. These can be used either in planting new orchards or in working over the seedling groves already established. Inoculation experiments with the organism causing the disease in the walnut showed that practically all species were susceptible to a large degree, while pecans gave negative results.

The other diseases, while of some importance in certain localities, are not general, and for the most part the causes and definite means of control are unknown.

Rust on Vinca, G. E. STONE (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 108, 109*).—A brief account is given of rust on Vinca, which apparently is common in Europe, though not hitherto reported in this country, and is attributed to *Puccinia vincæ*.

This rust made its appearance in a couple of locations in Massachusetts some two or three years ago. While the plants are grown out of doors during the summer, the disease makes its appearance in the greenhouse during the late fall and persists during the winter, affecting the leaves of the young, vertical shoots more seriously than those of the older, pendant ones. Both the green and variegated varieties seem subject to attack, although the latter are more severely affected.

Thus far, the author has been unable to determine whether the mycelium is perennial in the stem or not, but he thinks that if the infection occurs in outdoor plants, as in the case of the chrysanthemum rust, it can be readily controlled by indoor or tent-cloth culture, or by any other means that would keep the dew from the plants.

Witches' brooms on fir and their transmission, P. JACCARD (*Separate from Jour. Forest. Suisse, 1911, pp. 11, pls. 2, figs. 2; abs. in Ztschr. Pflanzenkrank., 22 (1912), No. 6, p. 377; Bot. Centbl., 122 (1913), No. 1, p. 4*).—The author describes a noteworthy form of witches' broom on fir and suggests the possibility that the sporadic appearance of such forms may be due to the fertilization of normal female flowers by pollen from trees showing the deformity.

[Fungi attacking Lecythis ollaria], G. VAN ITERSON, Jr., and N. L. SÖHNGEN (*Weekbl. Ingen., 18 (1911), pp. 260–264; abs. in Bot. Centbl., 117 (1911), No. 21, pp. 559, 560; Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 10–13, p. 315*).—The wood of *L. ollaria*, which is found to be attacked by *Poria vaporaria* (*Polyporus vaporarius*) and *Corticium calceum*, was investigated both as to structure and composition. The work of these parasites is claimed to be favored by the slow drying of this wood, due to its high power of imbibition and its relatively high content of starch.

[Oak mildew in France], G. QUÉRITET (*Bul. Soc. Cent. Forest. Belg., 19 (1912), No. 10, pp. 577–588*).—This is a brief discussion of the destructive oak mildew in France, recommending as a means of control on young oaks either powdered sulphur or Bordeaux mixture of 1.5 per cent strength.

A note on the hosts which afford a starting point for the common root disease of Para rubber, K. BANCROFT (*Agr. Bul. Fed. Malay States, 1 (1912), No. 3, pp. 141–143*).—In reply to a criticism by Petch of some of the author's previous work (E. S. R., 28, p. 153), he reports the fungus *Fomes semitostus* as occurring on a much larger number of plants in the Malay States than has been recorded in Ceylon. Among the more recent host plants noted for this fungus are bamboos and palms, representing the monocotyledonous plants, and a considerable number of dicotyledonous plants, including some of the fleshy rooted plants, such as cassava.

On account of the wide range of host plants, the author thinks there is little likelihood of selective removing of stumps being practicable as preventive treatment for the root disease in that country.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Birds in relation to a grasshopper outbreak in California, H. C. BRYANT (*Univ. Cal. Pubs., Zool., 11 (1912), No. 1, pp. 20*).—This paper deals with investigations into the relation of birds to a grasshopper outbreak conducted at Los Banos, Merced County, Cal., from July 11 to 17, 1912.

"Observation showed the following species of birds to be feeding on grasshoppers: Bicolored red-wing (*Agelaius phœniceus californicus*), western meadow lark (*Sturnella neglecta*), Brewer blackbird (*Euphagus cyanocephalus*), Bullock oriole (*Icterus bullocki*), western kingbird (*Tyrannus verticalis*), California shrike (*Lanius ludovicianus gambeli*), and the English sparrow (*Passer domesticus*). Stomach examinations showed all those observed to feed on grasshoppers to be effective destroyers of the pest, and also demonstrated that the following birds were also feeding on grasshoppers: Burrowing owl (*Speotyto cunicularia hypogœa*), killdeer (*Oxyechus vociferus*), Anthony green heron (*Butorides virescens anthonyi*), black phoebe (*Sayornis nigricans*), California horned lark (*Otocoris alpestris actia*), tricolored red-wing (*Agelaius tricolor*), and cliff swallow (*Petrochelidon lunifrons lunifrons*).

"The efficiency of the different species, when determined by destructive capacity, showed the burrowing owl to be the ablest destroyer; when determined by the numbers of individual birds in the territory, showed blackbirds, meadow larks, killdeer, orioles, and shrikes to take positions in the order named. Birds can not be considered a dependable means of control of all grasshopper epidemics, but can be inferred to be efficient in the prevention of many."

Some insects and other arthropods in the diet of the western meadow lark, H. C. BRYANT (*Pomona Col. Jour. Ent., 4 (1912), No. 3, pp. 807–809*).—This article presents information relating to the animal food of the western meadow lark (*Sturnella neglecta*), additional to that given in the account previously noted (E. S. R., 28, p. 155).

The numbers of insects destroyed by western meadow larks (Sturnella neglecta), H. C. BRYANT (*Science, n. ser., 36 (1912), No. 938, pp. 873–875*).—This paper relates to the investigations above noted.

Normal temperature of rabbits, C. FROTHINGHAM, Jr., and G. R. MINOT (*Amer. Jour. Physiol., 30 (1912), No. 6, pp. 430–435, figs. 4*).—The authors find that the temperature of rabbits is not absolutely stable, the extremes being 101.5° F. and 104.2°, with an average of 103.1°.

Insects of the year 1911, in Massachusetts, H. T. FERNALD (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 82–85*).—Among the more important insects of the year mentioned are cutworms, which were the source of considerable damage; the elm-leaf beetle, which was unusually destructive and was found in Nantucket for the first time; the leopard moth, which is now present almost everywhere in eastern Massachusetts near the coast and has even reached Nantucket; the 12-spotted asparagus beetle (*Crioceris 12-punctata*), which has been working its way northward, being taken at Concord and Roslindale near Boston in 1909, was first observed at Amherst; the cottony maple scale, which was unusually abundant in the Connecticut Valley on soft maple; the birch leaf skeletonizer (*Bucculatrix canadensisella*), unusually abundant on white and cut-leaved birches; the bronze birch borer (*Agrilus anxius*) in cut-leaved birches; *Leptura zebra*, which was found to have girdled large chestnut trees in the vicinity of Amherst; the elm-leaf miner (*Kaliosyphinga ulmi*), which was present in considerable abundance; and the maple leaf stem sawfly (*Priophorus acericaulis*), which was quite abundant in some parts of the State.

Mention is also made of a tropical roach (*Panchlora hyalina*) which was collected in a field half a mile from the nearest store, and of a blister beetle

(*Pomphopœa sayi*), not previously received by the station, which attacked and was the source of considerable injury to iris, roses, lupines, syringas, etc.

Report of the entomologist, H. T. FERNALD (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 72–76*).—This is a general report of the work of the year.

Tests of entomoid, which is said to be a combination of lime sulphur and miscible oil, gave very satisfactory results at strengths of 1:20 and 1:30, when applied to young apple and plum trees badly infested with scale shortly before the buds opened in the spring.

The ninth annual report of the state entomologist of Montana, R. A. COOLEY (*Montana Sta. Bul. 88, pp. 81–106*).—The first part of this report discusses the occurrence of insect pests in Montana in 1911. The status of the bee industry in the State, of the fever-tick investigations, and of forest insects follows. American foul brood was found to occur in apiaries at Joliet, and subsequent reports indicate that the disease is present over an extensive territory in that part of the State. The wax moth or bee moth was also found to be of very general occurrence, having been reported from 5 counties.

The report concludes with a discussion of the Montana insecticide law, which became effective February 15, 1911. The text of this law is appended.

[Insect control], F. SHERMAN, Jr. (*Bul. N. C. Dept. Agr., 33 (1912), No. 6, pp. 59, figs. 8*).—This bulletin deals with the San José scale (pp. 5–22), orchard spraying (pp. 23–43), and orchard protection (pp. 44–50).

Hydrocyanic-acid gas against household insects, L. O. HOWARD and C. H. POPENOE (*U. S. Dept. Agr., Bur. Ent. Circ. 163, pp. 8*).—This circular furnishes detailed information on the fumigation of houses with hydrocyanic-acid gas for the various household pests.

Digest and copy of insecticide law (*New Jersey Stas. Circ. 11, pp. 4*).—This circular presents the text of the act to regulate the sale of insecticides, approved on March 29, 1912.

The enemies of cress (Nasturtium-Sisymbrium), P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1912, No. 3, pp. 11–13; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, p. 1896*).—Some 27 insect pests of cress are listed.

Animal enemies of the sugar beet, O. FALLADA (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 1, pp. 19–25*).—Notes are given on a number of the more important insect enemies of the sugar beet in Austria-Hungary.

The enemies of the orange and lemon in Spain, L. DE SALAS Y AMAT (*Las Plagas del Naranjo y Limonero en España. Madrid: Govt. 1912, pp. 196, tables 12, pls. 13, figs. 35; Bol. Agr. Téc. y Econ., 4 (1912), Nos. 38, pp. 167–181; 39, pp. 267–281; 40, pp. 365–373; 41, pp. 485–492; 42, pp. 553–575; 43, pp. 647–677; 44, pp. 740–766; 45, pp. 844–867, tables 12, figs. 29*).—This paper, dealing with the enemies of citrus fruit in Spain, their natural enemies, and artificial control, has been previously noted in part (E. S. R., 27, p. 453).

Insects pests and diseases of bush fruits, W. H. LAWRENCE (*Better Fruit, 7 (1912), No. 6, pp. 16–18, 51–53, figs. 16*).—A brief account of the insect enemies and diseases of blackberries, raspberries, and their hybrids in the Northwest.

Insects affecting the grape, strawberry, currant, etc., A. L. MELANDER (*Better Fruit, 7 (1912), No. 6, pp. 15, 56–58, figs. 9*).—This is a popular account of the principal insect enemies of small fruits in the Northwest, with remedial measures therefor.

[Cranberry insect investigations in 1910 and 1911], H. J. FRANKLIN (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 17–19; 20–22*).—The 1910 work relates chiefly to the cranberry fruit worm, blackhead cranberry worm, and cranberry girdler (*Crambus hortuellus*). The lepidopterous insect *Gelechia trialbama-*

culella is said to have been the source of great injury to a few strictly dry bogs, but as this species is heavily parasitized, the author thinks that it will never do noticeable injury on winter-flowed bogs.

The 1911 investigations have been previously noted (E. S. R., 26, p. 857).

Nursery insects, H. B. WEISS and R. S. PATTERSON (*New Jersey Stas. Circ. 15, pp. 3–29, figs. 13*).—Brief summarized accounts are given of the more important insect pests occurring in nurseries with remedial measures therefor, as follows: The wood leopard moth, cottonwood leaf beetle (*Melasoma scripta*), bagworm, catalpa sphinx, poplar borer (*Saperda calcarata*), white pine weevil (*Pissodes strobi*), spruce gall aphid (*Chermes abietis*), pine bark aphid (*Chermes pinicorticus*), European elm scale, golden oak scale (*Asterolecanium quercicola*), pine leaf scale (*Chionaspis pinifoliæ*), San José scale, oyster shell scale, scurfy scale, and plant lice.

[Insect enemies of rubber], L. LEWTON-BRAIN (*Fed. Malay States Rpt. Dir. Agr., 1911, pp. 6–8*).—Among the more important insect pests mentioned are white ants (*Termes gestroi*), which, although the source of considerable injury, appear to be on the decrease; a widely spread scolytid, *Xyleborus parvulus;* the cricket *Brachytrypes achatinus*, which attacks the rubber plant in young clearings; and the quite generally distributed *Lecanium nigrum*.

The North American dragonflies of the genus Aeshna, E. M. WALKER (*Univ. Toronto Studies, Biol. Ser., 1912, No. 11, pp. VIII+213, pls. 28, figs. 7*).—This synopsis is based on some 1,720 specimens in the British Museum, various museums in America, and private collections.

The effect of temperature on the molting of the walking-stick, Diapheromera femorata, H. H. P. and H. C. SEVERIN (*Ent. News, 24 (1913), No. 1, pp. 14–19*).—This is a continuation of the work previously noted (E. S. R., 26, p. 147). The authors find that a low temperature has a tendency to decrease the number of molts, while a high temperature increases the number.

Papers on insects injurious to citrus and other subtropical fruits.—The red-banded thrips (Heliothrips rubrocinctus), H. M. RUSSELL (*U. S. Dept. Agr., Bur. Ent. Bul. 99, pt. 2, pp. 17–29, pls. 2*).—This paper is based upon observations made at Miami, Fla., and in a greenhouse at Washington, D. C.

The red-banded thrips, originally described from specimens collected in the island of Guadeloupe, has been an important enemy of cacao in the West Indies for the last 12 years, being commonly known as the cacao thrips. In addition to the West Indies, it is known to occur in Trinidad, Tobago, the Virgin Islands, Uganda, and Ceylon. In the United States it is confined to a short strip of the Florida east coast centering in Miami, but has been collected in one of the greenhouses of this Department at Washington, D. C., on plants from Mauritius, and has been recorded from the federal experiment station greenhouses in Honolulu. In Florida it is of particular importance as an enemy of the mango and avocado.

The adults and larvæ feed together and on both sides of the foliage, their removal of the chlorophyll leaving a minute spot which turns brown. These spots become very abundant and after a while run together, forming large brown patches near the main or side veins, the leaves later turning brown and drying up. In severe cases the entire leaf surface is infested and in such cases the larvæ move around to the other side and feed. In feeding, this thrips excretes over the surface of the infested leaves a reddish fluid in small spots, which hardens and turns black.

Technical descriptions are given of the various stages of this thrips. The adults are to be found in many cases mingling on the same leaf with *H. hæmorrhoidalis* and like this species select the tender young foliage to feed upon. While doing so the female deposits the eggs in the leaf. Reproduction

for portions of the year is parthenogenetic but at other times bisexual. The larvæ generally prefer the underside of the leaves, but the author has frequently observed them in large numbers on both sides. They feed clustered together in colonies, in folds of the leaf, or along the main vein, or even under red-spider webs. The prepupæ change to pupæ in among the colony of prepupæ and larvæ on the leaf.

In the greenhouse at Washington, the egg required from 15 to 16 days for incubation, at an average mean temperature of from 77 to 78° F. The length of the larval stage varied from 8 to 16 days, at an average mean temperature of 68 to 76°. A number of pupæ required from 4 to 7 days for development, at an average mean temperature of from 68 to 70°. The observations gave a total life cycle of 28 days as a minimum to 43 days as a maximum, at an average mean temperature of 70°.

A spray consisting of blackleaf tobacco extract 1 gal., whale-oil soap 1 lb., and water 50 gal. is said to have controlled this thrips at Miami.

A bibliography of 30 titles is appended.

Injury by thrips to the American vine, E. PANTANELLI (*Staz. Sper. Agr. Ital., 44 (1911), No. 7, pp. 469–514, pls. 2*).—*Drepanothrips reuteri* is the source of considerable injury in Sicily through its attacks on American stocks, particularly the Riparia and its hybrids. Two principal generations of this thrips are distinguished, the first living on the basic buds in the spring (April and May) and a second, which develops on the young shoots and suckers in summer (August and September).

An application of 4 per cent solution of lysol or calcium polysulphid during the resting stage (February 20 to March 10) and from 1 to 3 applications, at a strength of 2 per cent, in the spring or summer have given good results.

The chinch-bug situation in Illinois, S. A. FORBES (*Illinois Sta. Circ. 1912, May 3, pp. 7*).—This circular calls attention to the fact that the chinch bugs survived the winter of 1912 in excellent condition and on April 25 were scattering on the wing to lay their eggs. The escape of the bugs on foot, out of fields of small grain at harvest time, is thought to be best prevented by surrounding each field with a line of thick, viscid, road oil with post holes beside it some 30 ft. apart. "Such a line can be made and kept effective long enough to catch virtually all the bugs in a field at a minimum expense of 35 cts. a mile per day. . . . Coal tar may be used for the purpose where road oil can not possibly be obtained, but it must be much more frequently renewed to keep it effective . . . A well-made dusty furrow, with post holes in the bottom, may serve a temporary purpose in very dry weather, but is made useless by rain. Chinch bugs may be killed on corn, without injury to the plant, by a tobacco preparation (black-leaf 40) greatly diluted with weak soapsuds."

The importance of cooperating in the work is emphasized, organization by counties being recommended.

On the destruction of certain Hemiptera by vegetable parasites, L. LE MOULT (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 15, pp. 656–658*).—The author finds *Sporotrichum globuliferum* to destroy the cabbage bug (*Pontatoma ornatum*) in from 5 to 10 days. Successful results were obtained from the use of mixed cultures of *Isaria densa*, *S. globuliferum*, and *Botrytis bassiana* in combating the woolly apple aphis.

Injury to beets by plant lice in 1911, SOFIE ROSTRUP (*Tidsskr. Landbr. Planteavl., 19 (1912), No. 2, pp. 193–213*).—This paper reports experiments with spray mixtures.

The cassava hawk moth (Diplophonota ello), G. E. BODKIN (*Jour. Bd. Agr. Brit. Guiana, 6 (1912), No. 1, pp. 17–27, pl. 1*).—This insect is said to be the worst pest that has attacked Para rubber (*Hevea brasiliensis*) in British

Guiana, its defoliation greatly retarding the plant's growth. Control is difficult owing to its capability of existing on cassava and a large number of uncultivated plants occurring commonly on the waste lands and in the forests in the interior. A detailed account is given of its life history, habits, natural enemies, and means of control.

A proctrotrypid (*Telenomus dilophonotæ*) parasitizes the egg and a tachinid the larva. In Cuba *Microgaster flaviventris* acts as a check to this pest.

The willow tree caterpillar, C. B. HARDENBERG (*Agr. Jour. Union So. Africa, 4 (1912), No. 3, pp. 397–418, figs. 21*).—*Angelica tyrrhea* is a most destructive pest in forest plantations through its periodical stripping of willows, especially the weeping willow (*Salix babylonica*), of their foliage.

Methods for the control of insect pests with special reference to the Egyptian cotton worm (Prodenia litura), G. C. DUDGEON and L. H. GOUGH (*Agr. Jour. Egypt, 1 (1912), No. 2, pp. 55–65*).—This paper discusses the various methods applied to the control of this pest.

The blackberry bud moth, A. H. COCKAYNE (*Jour. New Zeal. Dept. Agr. 5 (1912), No. 4, pp. 372–374*).—The tineid *Carposina adreptella*, a hitherto rare native moth, has during the past 2 years come into prominence through its attacking the young shoots of the blackberry. It is classed as a beneficial insect, since in many districts in New Zealand the blackberry has become a very serious weed.

The potato-tuber moth (Phthorimæa operculella), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Circ. 162, pp. 5, figs. 3*).—This is a preliminary account prepared for the purpose of warning potato growers and furnishing general information in regard to remedies.

The potato tuber moth, which feeds upon the tomato, eggplant, and tobacco, as well as potatoes, and has for many years been the worst potato pest occurring in California, is said to have now reached the State of Washington. It has been known for several years in Florida, North Carolina, South Carolina, and Virginia as the splitworm of tobacco. It has been reported during the past 2 years as an enemy of potatoes at Eagle Lake and Hallettsville, Tex.; San José, Costa Rica; Seattle, Auburn, and Yakima, Wash.; New York City, where it has not become acclimatized so far as known; Fort Collins, Colo.; and Larimore, N. Dak.

The eggs are laid upon the leaves and other parts of the plant. The minute caterpillars quickly bore between the surfaces of the leaves or into the potato skin, which they mine in every direction, finally devouring the exterior. It is believed that there are 2 or more generations in the course of a summer and another one can be produced in storage.

The remedies mentioned include clean cultivation, crop rotation, and fumigation with carbon bisulphid or hydrocyanic-acid gas. A box suitable for fumigating from 100 to 200 bu. of potatoes is described.

Potato moth in Bengal, E. J. WOODHOUSE (*Agr. Jour. India, 7 (1912), No. 3, pp. 264–271*).—This is largely a report of control work.

The house mosquito, a city, town, and village problem (*New Jersey Stas. Circ. 13, pp. 12*).—A popular account of the life history and breeding places of *Culex pipiens*, with remedial measures.

Cabbage-top in swedes, T. H. TAYLOR (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet], 82, 1912, pp. 21, pls. 5, figs. 11*).—The author shows that the chief cause of so-called "cabbage-top" or "cabbage head" of swedes is due to the feeding of larvæ of the cecidomyiid *Contarinia nasturtii* upon the young leaves of the plant. The life history of the swede midge, effect upon the crop, and preventive measures are described.

Cabbage-top in swedes appears under 2 forms, crumpled-leaf and many-neck, the first mentioned being due solely to the attack of the swede midge, while many-neck is due to several distinct causes, one of which is the swede midge. Spraying for the midge is both troublesome and limited in its effect. The author thinks that the plan of trapping the midge at the beginning of the season is likely to give good results.

Flies and other insects as carriers of infection, W. NICOLL (*Brit. Med. Jour., 1912, No. 2704, pp. 1097, 1098*).—This article deals with the length of life of the rat flea (*Ceratophyllus fasciatus*).

In 64 experiments involving 463 fleas the average length of life at ordinary temperatures was found to be 6.8 days but the maximum in one experiment was over 40 days. Two per cent of the fleas lived for over 3 weeks and 10 per cent for more than 2 weeks. It appears that the larval and pupal stages, which normally last from 2 to 6 weeks, may be prolonged to over a year. See also a previous note (E. S. R., 28, p. 255).

The house fly and its relation to typhoid fever, W. E. BRITTON (*Proc. Sanit. Conf. Health Off. Conn., 6 (1912), pp. 21–38*).—An address delivered at the Sixth Sanitary Conference of the Health Officials of Connecticut.

The number and varieties of bacteria carried by the common house fly in sanitary and insanitary city areas, G. L. COX, F. C. LEWIS, and E. E. GLYNN (*Jour. Hyg. [Cambridge], 12 (1912), No. 3, pp. 290–319, pls. 2, figs. 2*).—"Over 450 naturally infected or wild flies (*Musca domestica*) were caught in Liverpool during September and the first part of October, 1911, from different parts of the city. The number and kinds of bacteria carried and contained by them have been investigated. The number of bacteria coming from house flies whilst struggling in liquid may be very large, varying from 2,000, the lowest figure in 5 minutes, to 350,000, the highest figure in 30 minutes. This number may be taken as a measure of their capacity to pollute liquid with their vomit or excrement, or by wallowing in it. The number of bacteria carried inside the fly is very much greater.

"Flies caught either in insanitary or congested areas of the city carry and contain far more bacteria than those from the more sanitary, less congested or suburban areas. The number of aerobic bacteria from the former varied from 800,000 to 500,000,000 per fly, and from the latter from 21,000 to 100,000. The number of intestinal bacteria as indicated by glucose bile salt fermenters is also greater in the insanitary or congested areas, the numbers varying from 10,000 to 333,000,000, than in the more sanitary areas where they carried from 100 to 10,000. Pathogenic bacteria and those allied to the food poisoning group were only obtained from the congested or moderately congested areas and never from the suburban areas."

The house fly as a carrier of typhoid infection, F. W. THOMSON (*Jour. Trop. Med. and Hyg. [London], 15 (1912), No. 18, pp. 273–277*).—This is a report of investigations made at the Central Research Institute of India. The experiments led to the conclusions that "the ingestion of typhoid germs in large numbers has no bad effect on the health of flies; they can retain living typhoid bacilli within their bodies and transmit infection thereby for a period of 24 hours after ingestion; they can carry the living germs on the exterior of their feet or bodies for a period of 6 hours, and so transmit infection."

A new fruit tree borer, T. ALVAREZ (*Rev. Asoc. Rural Uruguay, 41 (1912), No. 4, pp. 239–241, figs. 2; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1898, 1899*).—The cerambycid beetle *Hypermallus rusticus* is reported to be the source of injury to apple, plum, and quince trees in the Departments of Montevideo and Canelones,

Uruguay, through boring in the trunks and main branches. It is also said to attack the ornamental *Blepharocalyx lanceolatus.*

[The new sugar cane pest in Mauritius] (*Sta. Agron. Mauritius Bul. 26, 1912, pp. 60–67*).—This paper relates to *Phytalus smithii*, brief accounts of which have been previously noted (E. S. R., 27, pp. 259, 662).

Note on the avocado weevil (Heilipus lauri), H. S. Barber (*Proc. Ent. Soc. Wash., 14 (1912), No. 3, pp. 181–183, pl. 1*).—The author records the rearing of the avocado weevil in Washington, D. C., from seeds of *Persea pittieri* received from San José, Costa Rica. A specimen of this weevil, which is thought to have come from Mexican seed, was also collected at Whittier, Cal., in July.

The domestication of the bumblebee, E. Lindhard (*Tidsskr. Landbr. Planteavl., 19 (1912), No. 2, pp. 335–352, figs. 4*).—Notes are presented on the biology of a number of species of bumblebees occurring in Denmark.

The zoocecids of North Africa, C. Houard (*Ann. Soc. Ent. France, 81 (1912), No. 2, pp. 129–236, pls. 2, figs. 159*).—This is a continuation of the paper previously noted (E. S. R., 27, p. 564), and contains 113 additional cecids, making a total of 343. A general bibliography of the zoocecids in North Africa, including Morocco, Algeria, Tunis, Tripoli, and Egypt, is appended, together with indexes of the plants and of the insects, mites, and a nematode concerned.

New American mites, N. Banks (*Proc. Ent. Soc. Wash., 14 (1912), No. 2, pp. 96–99, pls. 2*).—Ten species are here described as new to science, of which *Tarsonemus waitei* appears to be of economic importance through its destruction of terminal peach buds at West Chester, Pa., and *Phyllocoptes amygdalina* through its injury to the leaves of *Amygdalus davidiana.*

The genus Otobius is erected for *Ornithodoros megnini*, which differs in habits and structure from other members of the genus.

FOODS—HUMAN NUTRITION.

Food standards, their nature, history, and functions, W. Frear (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 129, 130*).—Criteria of food standards are proposed, special note being made of the nature, matter, consistency, form, and function of the standards.

International standards are valuable for only a few products, the author believes. Provision should be made for necessary changes in standards, but such changes should be made as seldom as possible in justice to the producing interests.

Some of the results of the food and drugs act, W. D. Bigelow (*Orig. Commun. 8. Internat. Cong. Appl. Chem* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 57–64*).—Some of the general principles involved in the U. S. Food and Drugs Act of June 30, 1906, are discussed, together with a few of the fundamental changes which have resulted from the enforcement of the law. It is stated that mislabeling as to quantity, quality, place of origin, dietetic value, etc., has been much reduced, cleanliness much increased, and an attitude more conducive to the public health produced in the minds of the manufacturers.

Food products and drugs, 1912, J. P. Street et al. (*Connecticut State Sta. Rpt. 1912, pt. 2, pp. 95–208*).—Canned corn, dried fruits, gluten and special foods, honey, rice, canned tomatoes, and other food materials were examined, as well as a large number of drug products. Out of a total of 1,645 samples 618 were not found adulterated, while 508 were found adulterated or misbranded and 37 compound.

The claims of some of the gluten foods and special preparations to contain very low starch content were not substantiated, 6 out of 11 samples containing from 31 to 57 per cent starch. "The preparation of foods containing much gluten and little starch is an expensive process and higher prices must be charged for the resultant foods. But when a diabetic patient pays a high price for a food which is claimed to meet his particular needs, and analysis shows that the food is utterly unfitted for his requirements, he is defrauded and, depending on the manufacturer's claims, pays his good money for a food which may work actual harm upon him."

None of the samples of honey examined was declared adulterated or otherwise illegal, although there were wide variations in quality.

In discussing the results of the examination of polished and unpolished rice, the authors note that "unpolished rice gives a fused, glassy ash, while that of polished rice has a powdery appearance." Nearly half the samples of rice showed the presence of talc or some similar substance. "The use of talc or similar polishing material is objectionable for several reasons. It is entirely unnecessary, for if polishing must be practiced there are other methods less objectionable. Moreover the demand for white rice is a whimsical fancy of the purchaser, to satisfy which a part of the nutriment of the rice is removed."

On the basis of the detailed analyses and general data regarding canned tomatoes, the characteristics of such goods are discussed.

"The character of the fruit showed considerable variation. In 8 samples practically whole tomatoes were found; in 25, large lumps; in 4, small lumps; while in 4 a mushy consistency was observed. As regards ripeness, 31 samples were of excellent quality, while 10 contained more or less wholly or slightly green pieces. . . . Excluding the 2 samples sold in glass and intended for fancy trade, and the 3 samples in odd sizes, the cost per can ranged from 9 to 15 cts. The cost per pound of dry matter ranged from 75 cts. to $1.86 and the cost per pound of tomatoes of average water content from 4.8 cts. to 11.9 cts."

With reference to added water, the authors would condemn, on the basis of their findings and other data, any sample containing less than 3 per cent of sugar-free solids, less than 0.35 per cent of citric acid, or less than 0.4 per cent of salt-free ash. Of the 41 samples, 9 appeared to contain added water and 17 were considered suspicious.

In connection with data regarding the analysis of sausage, a method for determining starch in meat products is reported by E. M. Bailey and C. E. Shepard.

Continuing earlier work (E. S. R., 27, p. 565), data are reported regarding the net weight of various package goods.

Salmon canning industry of North America. H. M. Loomis (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, pp. 239–245*).—The present status of the industry and methods used in northwestern North America are described, and 6 analyses of canned and 2 of fresh salmon are given. Canned salmon showed a considerably lower water content and an ammoniacal nitrogen content two or three times as great as fresh salmon, although there was no apparent deterioration.

The packing of American sardines. H. H. Hanson (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, pp. 131–138*).—The American and French products are compared on the basis of data collected by the author, the methods used in the preparation of the former being described in detail.

"The two most important questions which have been studied are the cause of swells, that is, cans swelled out by inside pressure caused by fermentation, and the breaking of the fish during the process of preparation for the cans."

Swells are caused by imperfect sealing rather than by imperfect processing. Various causes are assigned to the breaking of the fish. One of the most important of these is the character of food found in the sardine, the so-called "red feed" especially rendering the flesh soft and easily broken.

The chemical composition of salt pickled bonito, U. SUZUKI, C. YONEYAMA, and S. ŌDAKE (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 339–348*).—Analyses are reported of this Japanese food product made from bonito.

Contribution to the chemistry of the ripening of "shiokara," Y. OKUDA (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 265–269*).—The experiments here reported had to do with the ripening of shiokara, a food product made from the organs of bonito and other fish, by autolysis and the action of micro-organisms.

Eggs preserved with silicate of soda, J. M. BARTLETT (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 51–56*).—Experiments made to determine a satisfactory method for preserving eggs by the use of water glass are described.

It was found by analysis that the silica and ash content were no higher in eggs so preserved than in fresh eggs, when the right kind of water glass, which does not contain free soda, was used, and that there was no loss of moisture, weight, or nutritive value in the preserved eggs. The quality of the product was adjudged superior to cold storage eggs.

On some dried milks and patent foods, A. W. STEWART (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 329–338*).—Analyses of 35 samples of dried milks and milk products free from starch, of 19 samples of malted and farinaceous foods, and of 13 miscellaneous products advertised as foods for growing children are presented.

The analytical methods used are explained and the question of starch in infants' foods discussed. Opinions of other authors unfavorable to the use of starch in infants' foods and to the use of various artificial and predigested foods are quoted.

On the composition of various products, grains, starchy tubers, and flours of French West Africa, A. HÉBERT (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc. pp. 143–146*).—Descriptions and analyses are given of Dahomey white corn, *Voandzeia poissonni* seed, Ignames tubers, etc.

Wheat flour—a monograph, H. SNYDER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 323–328*).—Errors in analysis of flours frequently result from variation in moisture content, occlusion, translocation, incomplete combustion, failure to distinguish between crude and pure ash, and the use of the factor 5.7 instead of 6.25 (which the author considers the more correct value) for converting total nitrogen into protein.

The usual method for determining crude fiber is unsatisfactory, a better method being extraction with 70 per cent alcohol after extraction with ether. Variations in moisture content affect the weight of packages.

The effect of modifying the gluten surrounding of flour, G. A. OLSON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18 (1912), Sect. VIIIc, pp. 283–300, pl. 1*).—Flours which had been made into dough with water, dialyzed, or decanted were dried, remilled, and bolted to make flour again. Gluten was determined using various reagents in order to discover the effect of modification of the surroundings.

Decinormal solutions of salts, acids, and alkalis mixed with untreated flour reduced the gluten yield. Remade dough flour was more prejudicially affected

by sulphuric, phosphoric, and hydrochloric acids than the original flour, and dialyzed flour more than remade dough flour. Patent flours gave similar results. Removal of the gliadin prevented gluten formation in the presence of water, acid, alkali, or salts, showing that gliadin does not act as an acid, alkali, or salt. Nitrogen-free flour with gliadin added did not form gluten in the presence of acids, alkalis, or salts. Dialyzed and decanted flours were found to have a little higher total nitrogen and alcohol-soluble nitrogen content than the original or the dough flour. Apparently there is some as yet unknown substance in flour which has a considerable effect in transforming the physical properties of the gluten.

The grinding of corn meal for bread, F. P. DUNNINGTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc, pp. 119–127*).—Results are reported of the examination of a large number of samples of corn meal secured from most of the corn-producing States.

The sparing use of corn meal for bread making as compared with the extended use of wheat for that purpose is ascribed to unsuitable methods of grinding and cooking. The author believes that there is no advantage in mixing wheat flour with corn meal, and that in grinding the rougher portions of the grain should be retained.

Experiments on the digestibility of potatoes, M. HINDHEDE (*Skand. Arch. Physiol., 27* (*1912*), *No. 4–6, pp. 277–294; 28* (*1912*), *No. 1–3, p. 164*).—In experiments covering 5 weeks, made with a 26-year old man on a diet composed exclusively of potatoes, with butter, oleomargarine, or coconut fat, it was found that the potatoes were practically completely digested. The food, urine, and feces were analyzed.

In the later article some corrections are given.

A chemical investigation of Asiatic rice, A. S. CUSHMAN and H. C. FULLER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect VIIIc, pp. 73–81*).—Chemical analyses, especially as to phosphorus content, of 27 samples of Asiatic rice are reported, and the possible relation of their composition to the etiology of beriberi is considered. The authors see no reason why white milled rice from any one section should be thought more responsible for malnutrition than similar rices from other sections.

On the preparation of "natto," S. MURAMATSU (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc, pp. 251–263; Jour. Col. Agr. Imp. Univ. Tokyo, 5* (*1912*), *No. 1, pp. 81–94*).—This is a description of the materials and methods used in the preparation of natto, a kind of vegetable cheese made by fermenting boiled soy beans wrapped in rice straw and set in a warm cellar to undergo alteration by bacterial action. The kinds of bacteria active in the preparation are described and analyses of the product are presented.

The material when dried showed the following percentage composition: Protein, 46; fat, 20; crude fiber, 6; nitrogen-free extract, 3; and ash, 5 per cent. The total nitrogen content was 7 per cent, of which 5 per cent was albuminoid nitrogen. Fresh natto contained about 53 per cent moisture.

Chemical study of the fruit of the Sorindeia oleosa, A. HÉBERT (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc, pp. 139–141*).—This is a study of the pulp and seed of the sun-dried fruit of a Sudanese tree.

The pulp, which is very sweet, is fermented to make a kind of cider, while the seed contains an oil which is of value for making soap.

An investigation on the manufacture of tea, S. SAWAMURA (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect.*

VIIIc, pp. 313–322).—It was found that in the manufacture of tea steaming should be so regulated as to kill the oxidizing enzyms, but not other enzyms which help to produce a fine aroma.

Rolling tea increases the solubility of the constituents and increases desiccation. Firing for an hour at 70° C. improves the color and flavor of green tea. The optimum temperature for firing black tea is about 80°. In both cases a higher temperature injures color and flavor. Refiring decreases tannin by oxidation and thein by volatilization. Solubility is slightly increased by moderate heating, but greatly decreased by overheating.

A study of the composition of cider vinegar, L. M. TOLMAN and E. H. GOODNOW (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, p. 359*).—The results of large scale experiments in manufacturing vinegar from cider in the ordinary commercial vinegar generator are presented.

From 40,000 to 50,000 gal. were made, and it was found that the product was as uniform in composition as the cider from which it was derived. It is stated that the data available before these experiments were made indicated wide variation in composition, making detection of adulteration difficult.

On the antiseptic rôle of common salt and of sugar in preserved foods, L. LINDET (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc. pp. 237, 238*).—The antiseptic action of common salt and of sugar is attributed to their depriving micro-organisms of a portion of their elementary structure through plasmolysis, thereby greatly reducing their reproductive power. Two series of experiments are reported in support of this theory.

The disappearance of oxygen in canned food containers, H. A. BAKER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, pp. 45–49*).—Formation of oxids with tin and iron, oxidation of tin or iron salts, and combination with nascent hydrogen resulting from the action of organic acids on the container are at least three of the ways in which oxygen disappears in tin food containers. Oxygen also combines with some foods, especially oily ones.

"Springers" in canned foods—causes and prevention, H. A. BAKER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washigton and New York], 18 (1912), Sect. VIIIc, pp. 39–41*).—The trade term "springers," the author states, is applied to cans with bulging ends, but containing perfectly sound and sterile food products.

Canned goods should be so packed that no springers will be found since the housewife believes that canned goods must have flat or drawn in ends if of good quality. "It is desirable that this test should always be applicable and sufficient. . . .

"When a can is a 'springer' there is too much gas in it or not enough space to hold the gas under negative pressure at all weather temperatures.

"The gases in the head space of these 'springers' are never more than three: Carbon dioxid [which usually constitutes 8–18 per cent of the gas], nitrogen, and hydrogen. Very often no hydrogen is found. Oxygen is practically never found.

"The carbon dioxid is formed in practically all canned foods during the time of processing. It is also formed excessively if food products are not worked through quickly from the beginning of their preparation to their final sterilization. This is true particularly of fruit and vegetable products after they have been peeled or their cells have been broken in any way or have been subjected to heat.

"If food products are allowed to stand in containers before sterilization, an excessive amount of carbon dioxid gas is formed."

Preventive measures recommended are the leaving of sufficient head space which must be exhausted, and the processing of the cans as soon as possible after sealing. In the case of highly acid products the metallic container should be protected by a coating of enamel.

Experiments on feeding guinea pigs "salts of tin" in measured quantities for several weeks, H. A. BAKER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc, pp. 31–34*).—Guinea pigs were fed a ration to which hydrates of tin had been added. A daily dose of 12.6 mg, proved fatal in from 9 to 25 days upwards. Accumulation of tin in the liver was found, and elimination after dosage of tin was discontinued took place rather slowly.

On the changes induced in blood by feeding—a study in cellular physiology, G. MANN and J. G. GAGE (*Lancet*) [*London*], *1912, II, No. 16, pp. 1069–1073, pl. 1*).—During digestion the nuclei of the leucocytes stain more readily, the rim of cytoplasm becomes narrower, the granules increase in size and number, and the leucocytes diminish in size.

The deeper staining and increased size and the fewer and smaller granules may be accounted for on the supposition that there is a considerable production of new leucocytes during this period, but the authors believe that the effects observed are due to indigestion of food material by the leucocytes. The granules are probably zymogen granules used in intracellular activities, also serving some other function, possibly assisting in assimilation of dead cells. They are probably not food material, since they do not materially decrease in number during starvation. Macrochemical investigations are under way to test the theory established by histological methods, that "cellular metabolism in both plants and animals is invariably accompanied by an increase in nuclear metabolism, as evidenced by the increase in nucleo-protein material."

Progress report of nutrition investigations in the United States, C. F. LANGWORTHY (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc, pp. 149–228*).—Progress in the study of human nutrition since the Seventh International Congress of Applied Chemistry and the present status of nutrition investigations in the United States are considered under the following heads: Studies of food and food products; special studies of ash, protein, and other food constituents; cooking in its relation to nutritive value; canning, preserving, handling and storage; dietary studies and dietetics; digestion; metabolism—respiration calorimeters, bomb calorimeters, and experiments with them; foods and their relation to problems of hygiene; and cost of living and other statistical data.

An improved form of respiration calorimeter for the study of problems of vegetable physiology, C. F. LANGWORTHY and R. D. MILNER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *18* (*1912*), *Sect. VIIIc pp. 229–236, pls. 3*).—For a similar article see a previous note (E. S. R., 27, p. 568).

ANIMAL PRODUCTION.

The digestibility of cattle foods, J. B. LINDSEY and P. H. SMITH (*Massachusetts Sta. Rpt. 1911, pt. 1, pp. 244–277*).—A report of metabolism experiments in 1906–1910. Three lots of Southdown wethers were used, one being 7 years of age and the other lots 4 and 5 years old. The hay used consisted of finely mixed grasses, containing a large proportion of June grass. The results are averaged in the following table:

Average digestion coefficients obtained with sheep.

Kind of feed.	Dry matter.	Protein.	Fat.	Nitrogen, free extract.	Fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Pride of the North corn fodder	76.94	63.26	83.92	83.52	66.37	36.10
Leaming corn fodder	70.04	59.78	76.02	76.68	61.48	36.38
Early Mastodon dent corn fodder	71.88	57.07	80.50	78.99	60.12	35.82
Rustler White dent corn fodder	69.49	42.72	76.46	77.80	58.93	27.83
Brewer dent corn fodder	72.21	68.75	68.16	76.56	68.80	46.41
Wing Improved White Cap dent corn fodder	70.38	62.99	70.21	75.97	64.93	39.08
English hay	62.08	49.10	49.27	64.53	66.66	42.45
Alfalfa hay	60.46	73.77	28.32	69.92	47.55	45.39
Clover hay	61.58	61.92	58.89	68.50	52.93	58.09

The Leaming corn fodder was rather less digestible than the Pride of the North, due to its coarser stalks and its relatively less ear production. The Early Mastodon and Brewer dent corn fodder were evidently rather too late for the average Massachusetts season. At the time of cutting they were in the milk-to-denting stage and were not considered ripe enough to be cut for grain. The English hay consisted of mixed grasses, with June grass predominating, cut when in blossom, well cured, and in good condition. Before feeding it was cut fine, by running through a feed cutter. The Wing Improved White Cap dent corn fodder was in the milk stage and still green. The alfalfa hay was grown on the college farm, cut when in early blossom, and quite free from weeds and grass. Both first and second cuttings were used. The first cutting of clover was in early blossom when cut, but was not in a satisfactory condition because the season was unfavorable. The second cutting was more favorable.

Digestion coefficients of a number of proprietary dairy feeds are also reported and analyses of all the feeds are given.

Digestion experiments with cattle feeds, J. B. LINDSEY (*Massachusetts Sta. Rpt. 1911, pt. 2, pp. 47–53*).—A summary of the work noted above.

Feeding experiments with horses and cows, H. ISAACHSEN ET AL. (*Ber. Norges Landbr. Höiskoles Virks., 1910–11, pp. 10–33*).—Eight horses were fed raw potatoes with concentrates of medium or low-protein contents (corn, oats, rye feed, or ground peas), in the proportion of 1 part concentrates to 1 part dry matter in potatoes, without any unfavorable results as regards maintenance of the weights of the horses. Other experiments with potatoes for horses are briefly reviewed.

Basal rations composed of wheat bran (later on corn), hay, cut straw, and turnips (later on silage from turnip tops or molasses), were fed to 20 cows for 40 days, with a preliminary feeding period of from 25 to 30 days. The results obtained showed that similar amounts of cotton-seed meal and fish meal from herrings could replace each other without influencing the milk production of the cows.

The losses in dry matter observed in boiling and steaming turnips and potatoes were as follows: Turnips, boiled whole 16.6 per cent, cut into 8 pieces 21.4 per cent, steamed 9.5 per cent; potatoes, boiled whole 3.2 per cent, cut into 4 pieces 6.1 per cent, steamed 0.8 per cent. The largest losses in the case of the turnips fell on sugar and ash, viz, for those boiled whole, 21.5 and 24.3 per cent, respectively; cut, 25.9 and 26.1 per cent; and steamed, 8.4 and 12.5 per cent.

On the value of dried yeast for domesticated animals, W. VÖLTZ, J. PAECHTNER, and A. BAUDREXEL (*Landw. Jahrb., 42 (1912), No. 2, pp. 193–254*).—This

contains a report of feeding tests and metabolism experiments, in which dried yeast constituted a part of the ration for rats, sheep, and horses.

Observations on the feeding value and other properties of some plants in the Province of Viatka, M. PANKOV (*Trudy Bûro Prikl. Bot. (Bul. Angew. Bot.), 4 (1911), No. 11, pp. 559–562*).—This contains brief notes on about 80 species of grasses and forage plants grown in Russia.

Indian gram and flat peas, E. BERLINER (*Ztschr. Gesam. Getreidew., 4 (1912), No. 7, pp. 191–194, fig. 1*).—A ration consisting of barley and Indian gram or chick pea (*Cicer arietinum*) produced cheaper gains in swine than barley alone, or with other mixed rations which were used in the trial. In moderate amounts these feeds proved satisfactory in rations for horses. The flat pea (*Lathyrus sativus*) was found to be unsatisfactory as a feed for swine.

Observations on pastures and the forage plants of German East Africa, SCHELLHASE (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 42, pp. 769–774*).—This contains brief notes on many species of East African plants.

Alpine pastures in the Province of Como, A. SERPIERI (*Atti della Commissione d' inchiesta sui Pascoli Alpini.—I Pascoli Alpini della Provincia di Como. Milan, 1912, vol. 3, pp. XVI+370; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1211–1214*).—This contains descriptions and statistical data relating to Alpine pastures, with suggestions in regard to their improvement.

Physiological significance of the changes in the mineral content of feeds caused by soil and climate, ZUNTZ (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 2, pp. 570–593*).—The author discusses the significance of ash in animal nutrition and the factors influencing the proportion of the different mineral compounds making up the total ash in feeding stuffs. Sample rations are offered, showing how combinations can be so made as to supply the proper amount of all necessary mineral constituents.

Inspection of feeding stuffs, E. L. BAKER (*New York State Sta. Bul. 351, pp. 187–317*).—This contains the text of the state feeding stuffs law, definitions of feeding stuffs adopted by the Association of Feed Control Officials, tables of average composition of feeds, and results of feed inspection.

Analyses are reported of cotton-seed meal, linseed meal, malt sprouts, dried brewers' grains, dried distillers' grains, gluten feed, gluten meal, hominy feed, meat meal, bone meal, dried blood, alfalfa meal, dried beet pulp, corn bran, pea meal, by-products of wheat and buckwheat, and mixed feeds.

Analyses of feeding stuffs, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1912, Apr., pp. 3–20*).—This contains analyses of feeding stuffs collected and analyzed by the station during the fall and winter of 1911–12, including meat and bone scrap, cotton-seed meal, linseed meal, gluten meal and feed, malt sprouts, dried brewers' grains, wheat middlings, wheat bran, provender, chops, hominy feed, dried beet pulp, rye middlings, and mixed proprietary and poultry feeds.

[Registered feeding stuffs] (*Kansas Sta. Feeding Stuffs Bul. 23, pp. 14*).—This bulletin explains the state feeding stuffs law and contains a list of the feeds registered September 30, 1912.

Digest and copy of feeding stuffs law (*New Jersey Stas. Circ. 10, pp. 8*).—This contains the text of the state feeding stuffs law, and a brief interpretation thereof by the state chemist.

Computing rations for farm animals, E. S. SAVAGE (*New York Cornell Sta. Bul. 321, pp. 3–34, figs. 4*).—This discusses the composition and requirements of the animal body and gives directions for computing farm rations. Sample rations are given and analyses of the common feeding stuffs are compiled in tabular form.

The relation of cattle feeding to permanent agriculture, C. E. THORNE (*Ohio Farmer, 130 (1912), No. 22, pp. 529, 530, fig. 1*).—This is an address before the Indiana Cattle Feeders' Association, November, 1912. Besides a general discussion of this subject, it summarizes some results of the experiment stations showing the increased yields of crops due to keeping live stock.

Measures taken by the French Government in order to contend with the effect of the persistent increase in the price of meat (*Bul. Internat. Assoc. Refrig., 2 (1911), No. 15–17, pp. 269–272; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 1, pp. 1, 2*).—This is the report of a commission appointed to study the high prices of meat, and to submit remedial recommendations.

Third general conference of the National Live Stock Association (*3. Gen. Conv. Nat. Live Stock Assoc. [Canada], 1912, pp. 132*).—This contains a number of addresses on the present condition of the live-stock industry in the different Canadian provinces.

Breeding in Kivu, F. CARLIER (*Bul. Agr. Congo Belge, 3 (1912), Nos. 3, pp. 741–755; 4, pp. 775–798, figs. 24*).—An account of the live-stock industry in the eastern part of the Belgian Congo.

[Animal production and dairying], G. H. KNIBBS (*Off. Yearbook Aust., 5 (1901–1911), pp. 333–358, 438–451, figs. 3*).—This contains statistical data for the period 1901–1911, and a brief account of the development of the live-stock industry in Australia.

Economic factors in cattle feeding.—II, Argentina as a factor in international beef trade, H. W. MUMFORD (*Illinois Sta. Circ. 164, pp. 3–18, figs. 10*).—This bulletin discusses the present and the possible future of the beef industry in Argentina, which is now supplying European markets with beef formerly obtained from the United States.

The five provinces of Buenos Aires, Corrientes, Entre Rios, Santa Fe, and Cordoba, known as the pampas grass region, contain over 80 per cent of the cattle in Argentina. Approximately 5,000,000 cattle were slaughtered in 1911, of which about 1,000,000 were shipped abroad as dressed beef, and a considerable proportion of the remainder was prepared for export in other forms. The exports of beef have increased from 64,000,000 lbs. in 1885, to 580,000,000 lbs. in 1910. Argentine grass-fed beef sells on the English market within from 2 to 5 cts. per pound of corn-fed beef from the United States.

Expansion of the cattle raising industry in Argentina has ceased, however, largely because grain growing has proved more profitable, and as the cost of beef production will increase with increased cost of labor and land it is thought that on the whole the business of raising beef cattle in the United States will not be permanently menaced by Argentine competition. A bibliography is appended.

The aurochs and the bison, W. A. BAILLIE-GROHMAN (*Country Life [London], 32 (1912), No. 830, pp. 742–745, figs. 7*).—This contains reproductions and brief descriptions of old pictures of bison in Europe and the European wild ox as he appeared to artists in the sixteenth, seventeenth, and eighteenth centuries.

Measurement of the zebu of Formosa and India, H. YANAGAWA (*Trans. Sapporo Nat. Hist. Soc., 4 (1912), No. 1, pp. 1–7*).—This reports measurements of 30 Formosan zebu cows and 1 bull of the same grade. Werner's methods of measuring were followed.

Chemical and bacteriological study of fresh and frozen New Zealand lamb and mutton, A. M. WRIGHT (*Jour. Soc. Chem. Indus., 31 (1912), No. 20, pp. 965–967*).—Carcasses weighing 34 and 48 lbs. were split immediately after slaughter, and portions were taken from one-half of each carcass and finely

minced to obtain a uniform sample. The other half of the carcass was held in cold storage at from 2 to 19° F. for 160 days.

To determine the changes due to putrefaction the minced meat was placed in a flask of water and inoculated with infusions from putrefying meat. The initial stages of putrefaction were characterized by the transformation of insoluble to soluble proteids, and a conversion of coagulable proteids to proteoses, peptones, meat bases, and ammonia, while the latter stages of the process were marked by the formation of the simpler compounds such as ammonia, carbonic acid, and water.

There was a progressive increase in the amount of soluble matter, the total soluble nitrogen rising from 21.7 per cent of the total nitrogen present in the fresh lamb to 75.5 per cent after 14 days. The ammoniacal nitrogen in the lamb rose in 10 days to 53.4 per cent. A study of changes due to ripening in the absence of bacteria showed that the increase of organic extractives, total soluble nitrogen, meat-base nitrogen, and proteose and peptone nitrogen took place up to between the third and fifth day, when further changes either ceased or proceeded slowly.

The conclusions drawn from holding the lamb and mutton in cold storage were as follows: "There was a loss of moisture amounting to from 2½ to 3½ per cent. There was an increase in the amounts of proteose, peptone, and meat-base nitrogen, and a decrease in coagulable nitrogen, while ammoniacal nitrogen remains unchanged. These changes were similar to those occurring during the ripening of meat in absence of bacterial interference, the maximum change taking place in the lamb about the sixtieth day and in the mutton between the ninetieth and one-hundred-and-twentieth days. The free acidity of the fat remained practically unchanged. The changes in chemical composition were probably due to enzym action. The meats remained in the same condition bacterially as when freshly killed. When the freezing and subsequent thawing were carried out slowly there was no rupture or alteration of the structure of the tissues. The nutritive values of lamb and mutton were unaltered."

A bibliography of other work on similar problems is appended.

Inbreeding on a Rambouillet sheep ranch, R. Schmehl (*Arb. Deut. Gesell. Züchtungsk., 1912, No. 15, pp. 95, pls. 19*).—This discusses inbreeding, and especially the methods practiced on a noted sheep farm where the foundation flock was begun in 1865. Pedigrees of a number of noted blood lines are given.

The influence of food and shelter upon gains in weight and slaughter tests in growing swine, W. Völtz (*Landw. Jahrb., 42 (1912), No. 1, pp. 119–179, pls. 4*).—The gains made with a group of swine kept in the open and fed a ration of dried yeast, potatoes, and barley with a small quantity of salt and calcium phosphate cost 0.59 mark per kilogram of increase in live weight (about 6.4 cts. per pound). The cost of gains for a similar group kept in a pen was 0.52 mark per kilogram.

The author considers this to be a cheap ration, but that the fattening process ceased to be profitable after the pigs had obtained a weight of 220 lbs. The slaughter test showed that the meat from both lots was of good quality.

The skin of the pig, E. Kränzle (*Arch. Mikros. Anat., 79 (1912), No. 4, I, pp. 525–559, pls. 2, figs. 5; abs. in Jour. Roy. Micros. Soc. [London], 1912, No. 4, p. 394*).—This contains the results of a detailed study of the histology of pig skin.

"The division of the corium into papillary, intermediary, and reticular strata is inadequate. The whole surface of the corium shows well-developed papillary bodies. There are numerous free sudorific glands not connected with hair follicles. There are large sebaceous glands in the mucous membrane of the lips,

which show very fine hairs in connection with them. The statement of Flatten that the wild boar has no sudorific glands and the English pig no sebaceous glands is erroneous."

Pig insurance clubs in 1911 (*Jour. Bd. Agr.* [*London*], *19* (*1912*), *No. 8, pp. 679–691*).—This contains statistics of the cooperative pig insurance clubs, of which there are more than 1,000 in England and Wales, comprising about 50,000 members. This is said to be one of the most successful forms of cooperation in Great Britain.

Studies on the functional adaptation and on anatomical and physiological differences between warm- and cold-blooded horses, M. MÜLLER (*Arb. Deut. Landw. Gesell., 1911, No. 189, pp. 116, pls. 6, figs. 8; abs. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 3* (*1912*), *No. 4, pp. 962–967*).—This contains further details of work previously noted (E. S. R., 26, p. 875).

On the mechanism of the stomach of horses in the act of drinking, A. SCHEUNERT (*Pflüger's Arch. Physiol., 144* (*1912*), *No. 8–10, pp. 411–435, figs. 27*).—After slaughter the stomachs of horses were carefully removed and frozen. The position of the contents of the stomach and the probable action of the muscles were studied by means of cross and longitudinal sections.

The ancient and improved horse of Camargue, F. DE CHAPEL (*Bul. Soc. Nat. Acclim. France, 59* (*1912*), *No. 8, pp. 225–235, figs. 3*).—This contains the history and characteristics of this breed, based mainly on the recent work of Drouet. It is reported that this breed existed from prehistoric times in the valley of the lower Rhone. It is regarded as valuable for crosses with other breeds, especially for remounts.

The production and improvement of heavy horses in Lombardy, A. CUGNINI (*Ann. Ist. Agr.* [*Milan*], *10* (*1910–11*), *pp. 41–91, figs. 12*).—This contains statistics and methods of feeding, breeding, and general conditions of the heavy horse industry in Lombardy.

Feed, care, and management of breeding stallions, brood mares, work horses, and foals, F. C. MINKLER (*New Jersey Stas. Circ. 8, pp. 18, pls. 3*).—Under the following headings the author offers useful suggestions to those engaged in horse breeding: The breeding stallion, age to breed, brood mare, foal, work horses, and driving horses.

The feeding of farm horses (*Agr. Gaz. N. S. Wales, 23* (*1912*), *No. 10, pp. 829–852*).—This describes methods of feeding horses at the Hawkesbury Agricultural College and the experimental farms in New South Wales.

Constitutional vigor in poultry, C. A. ROGERS (*New York Cornell Sta. Bul. 318, pp. 573–614, figs. 11*).—This reports data on the health and egg production of weak and vigorous pullets of White Leghorn and Barred Plymouth Rock breeds.

Some of the White Leghorns were separated into weak and vigorous lots when 10 weeks of age. With better care the weak chickens began to improve, so that in time the pullets were so satisfactorily developed that they would have been retained by most farmers for laying or even breeding purposes. When the records of production were begun 25 pullets and 2 males were put in each pen. The strong males were put in the pen with the strong females.

Although the food consumed was on the average greater in the strong pens, in all instances the amount of dry matter required to produce a pound of eggs was less for the strong fowls than for the weak, as shown in the following table, which contains the record for 1 year:

Consumption of food by pullets per pound of live weight and per pound of eggs produced.

	Summer selected pullets.		Fall selected pullets.				True average.	
	White Leghorns.		White Leghorns.		Barred Plymouth Rocks.			
	Strong.	Weak.	Strong.	Weak.	Strong.	Weak.	Strong.	Weak.
Dry matter consumed per pound of live weight	*Lbs.* 17.20	*Lbs.* 20.40	*Lbs.* 17.75	*Lbs.* 16.43	*Lbs.* 13.55	*Lbs.* 15.05	*Lbs.* 15.71	*Lbs.* 16.34
Dry matter required per pound of eggs produced	3.92	4.32	4.45	4.97	5.00	5.24	4.44	4.77
Food required to produce 1 dozen eggs	7.49	8.24	8.07	9.44	9.50	9.69	8.33	8.95

The greatest broodiness occurred in a strong Plymouth Rock pen. Both strong and weak flocks of the Plymouth Rocks were more broody than the Leghorns, while the weak and strong Leghorns were equally broody. The greater number of deaths occurred among the weaker fowls. The strong Plymouth Rocks were about a month earlier in finishing their molt than the weak lots, but there was practically no difference between the weak and strong Leghorns. The true average percentage of eggs laid was uniformly higher in the strong than in the weak pens, except for 2 or 3 weeks in fall, when the weak pens in all three comparisons gave a higher production, due perhaps to molting. The fluctuation in quantities of food consumed varied more according to the season of the year than to the vigor of the individual. The greatest consumption began in March and lasted through April, and the heaviest egg production was in March, April, May, and June. The variation in weight followed that of food consumption. The effect of heavy laying was to reduce the weight of the fowl. The eggs from both strong and weak pens weighed approximately the same. The average cost of food per dozen eggs was 12 cts. for the strong pens and 13.1 cts. for the weak pens, or if the value of gain in weight is deducted from the cost of food 10.8 and 11.7 cts. for the strong and weak pens, respectively.

The incubation of several hundred eggs per flock showed some advantages in fertility, hatching power, and weight of the chicks in favor of the strong pens. The Plymouth Rocks gave a smaller percentage of chicks to the number of eggs than did either of the other 2 pens. The Leghorn day-old chicks were heavier than the Plymouth Rock chicks, though the eggs in the strong Plymouth Rock pens were heavier than the egss in some of the pens of Leghorns, thus indicating a negative correlation between size of chick and breed and size of egg. The mortality up to 6 weeks of age was slightly greater among the chicks from the strong pens, which could not be accounted for by the appearance of the chickens. There was a greater mortality with the Leghorns than with the Plymouth Rocks. At the end of 6 weeks the advantage was in favor of the strong pen. Although the mortality among the Plymouth Rocks was less than among the Leghorns, it required 2.8 eggs for each Leghorn and 2.9 eggs for each Plymouth Rock chicken at 6 weeks of age. When penned up in the fall the average weight of the pullets in the strong pens was 3.53 lbs. and in the weak pens 2.99 lbs. The difference was greatest with the Plymouth Rocks.

The food consumption and egg production showed practically the same conditions in the second as in the first year, but there was a high mortality in two of the strong pens which was unaccounted for. The average cost to produce

eggs the second year was from 3 to 5 cts more per dozen than for the first. In studying the effect on the progeny it was found that the second generation consumed more food per fowl than did the first. In every instance the food consumption was greater in the strong pen. Egg production was greater on a narrow ration. More pounds of food per pound of live weight was required by the weaker flocks except for the progeny of the summer selected Leghorns. The strong fowls were broody more frequently than the weak. The mortality was higher in the 2 strong Leghorn pens than in the weak, but lower in the strong Plymouth Rock pen. The egg production was decidedly in favor of the strong flocks.

Some of the results of the 2 years' work with the original flock and with one year's progeny are summarized in the following table:

Financial statement per hen per year.

	Summer selected pullets.		Fall selected pullets.				True average.	
	White Leghorns.		White Leghorns.		Barred Plymouth Rocks.			
	Strong.	Weak.	Strong.	Weak.	Strong.	Weak.	Strong.	Weak.
Value of eggs	$3.07	$3.01	$2.67	$2.35	$2.98	$2.66	$2.93	$2.72
Value of gain in weight	.04	.04	.02	.03	.14	.18	.07	.09
Cost of food	1.24	1.26	1.23	1.15	1.60	1.51	1.35	1.32
Cost of loss of stock	.04	.05	.14	.15	.18	.10	.11	.09
Total income	3.11	3.05	2.69	2.38	3.12	2.84	3.00	2.81
Total outgo	1.28	1.31	1.37	1.30	1.78	1.61	1.46	1.41
Balance profit	1.83	1.74	1.32	1.08	1.34	1.23	1.54	1.40

The following conclusions are drawn: "The selection of fowls for strong vitality, even though the selection be slight and exercised but once, increases the productive and the reproductive power of a flock. One selection only, no matter how rigid, is not sufficient to keep a flock permanently superior. The selection of mature pullets is of more value than that of partly grown chickens. Selection at the beginning of the second year is of equal importance to that of the first year."

Epoch achievements in egg laying (*New England Homestead, 65 (1912), No. 21, pp. 481, 485*).—This gives the results of egg-laying contests conducted at Storrs, Conn., and Mountain Grove, Mo.

The care of market eggs, W. A. Brown (*Canada Dept. Agr., Branch Live Stock Comr. Bul. 16, 1912, pp. 24, pl. 1, figs. 25*).—This discusses the kinds of losses which result from the usual methods of handling eggs. Specific suggestions are offered for improvement.

The government poultry farm at Washington (*Farm Poultry, 23 (1912), No. 12, pp. 273–275, figs. 6*).—A description is given of the equipment with a report of the progress made at the poultry farm in Beltsville, Md., under the management of this Department.

General biology, O. Hertwig (*Allgemeine Biologie. Jena, 1912, 4. ed., rev. and enl., pp. XVIII+787, figs. 478*).—The principal additions made to the previous editions of this work (E. S. R., 24, p. 670) are on the effect of radium and X-rays on germ cells and cell division, cultivation of tissues outside the animal body, sex determination, the significance of the chondriosomes, X-chromosomes, hormones, graft hybrids, dimorphism of spermatozoa, secondary sexual characters, and new views concerning the inheritance of acquired characters.

The normal presence of boron in animals, G. BERTRAND and H. AGULHON (*Compt. Rend. Acad. Sci.* [*Paris*], *155* (*1912*), *No. 3, pp. 248–251; abs. in Jour. Chem. Soc.* [*London*], *102* (*1912*), *No. 599, II, pp. 854, 855*).—Small amounts of boron were found to be present in various tissues and organs of the guinea pig, rabbit, sheep, ox, and horse, being most easily detected in the hair, horns, bones, liver, and muscles.

Investigations on the relation between sexual glands and lime metabolism, F. REACH (*Biochem. Ztschr., 42* (*1912*), *No. 1, pp. 59–66*).—Working with white mice, the author found that in desexed males the retention of lime was relatively less in proportion to body weight than in normal animals, whereas there was no appreciable difference between normal and desexed females.

On feeding young white rats the posterior and the anterior parts of the pituitary gland, T. B. ALDRICH (*Amer. Jour. Physiol., 31* (*1912*), *No. 2, pp. 94–101, figs. 2*).—The daily ingestion of 30 mg. of fresh desiccated posterior lobe of the pituitary gland did not stimulate or retard growth in young white rats. Similar results were obtained in feeding the same amount of anterior lobe, but the results were less conclusive.

On an apparent fallacy in the statistical treatment of "antedating" in the inheritance of pathological conditions, K. PEARSON (*Nature* [*London*], *90* (*1912*), *No. 2247, pp. 334, 335*).—It appears to the author that the idea of antedating, i. e., the appearance of hereditary disease in an earlier age of the offspring than in the parents, is based on a statistical fallacy, although it is stated that this apparent fallacy may not be real. It is further explained by mathematical formulas.

Methods of breeding for disease resistance, P. VAN EWING (*Breeder's Gaz., 62* (*1912*), *No. 20, p. 1032*).—A brief report on an experiment now in progress at the Kansas Station in breeding mice resistant to disease, with a view to applying the same methods in breeding domestic animals.

Inbreeding experiments with 4-horned goats, R. MÜLLER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 7* (*1912*), *No. 3–4, pp. 240–251, figs. 16*).—A preliminary note on the progeny obtained by mating a 4-horned female with normal male goats, and inbreeding with the offspring which inherited 4 horns. Not enough numbers have yet been obtained to know whether inheritance is in accord with Mendel's law. There was, however, one animal in the F_2 generation born with 6-horn buttons, 2 of which united soon after birth and grew into one large horn. Among the females there was a noticeable decrease in yield of milk.

List of characters subject to Mendel's law, C. C. HURST (*Verhandl. Naturf. Ver. Brünn, 49* (*1910*), *pp. 194–213*).—This is a list of Mendelian characters in man and in plants and animals, arranged alphabetically according to genera.

Bibliographia evolutionis (*Bul. Sci. France et Belg., 45* (*1911*), *Bibliogr. Evolutionis, 2* (*1911*), *pp. 179*).—This is a continuation of abstracts of literature on evolution, heredity, genetics, and related topics (E. S. R., 25, p. 870).

Recent literature in animal breeding, H. KRAEMER (*Mitt. Deut. Landw. Gesell., 27* (*1912*), *No. 45, pp. 625–628*).—This reviews a number of recent German publications in regard to the breeding of animals.

DAIRY FARMING—DAIRYING.

[Contributions to the history of dairying] (*Hoard's Dairyman, 1912, Dec. 20, pp. 633–641, 646, 647, 650, 651, 653, 655, 658, 659, figs. 58*).—A series of articles on the history of dairying, including the following: A Story of the Dairy Cow in Japan, by A. Miyawaki; A Brief History of Butter Making, by R. M. Washburn; Evolution in the Production of Market Milk, by E. Kelly;

Evolution of the Modern Dairy Barn, by C. P. Goodrich; Advancement in the Manufacture of Cheese, by E. L. Aderhold; Sixty-four Years a Dairyman, by H. B. Gurler; and Danish Dairy Progress, by J. H. Monrad.

Dairying on the farm, H. H. Dean (*Ontario Dept. Agr. Bul. 206, 1912, pp. 43, figs. 13*).—This contains information on planning dairy barns, testing and care of milk, separating cream, and making butter and soft cheese.

California dairy production (*Pacific Rural Press, 84 (1912), No. 26, pp. 666, 667*).—This article gives statistics on the production of milk, butter, and cheese in 1911 and 1912.

Evolution of the dairy industry in Britain, J. Wilson (*Hoard's Dairyman, 44 (1912), No. 22, pp. 671–673, figs. 5*).—A brief outline of ancient and modern methods of dairying in Great Britain and Ireland.

Dairying in western Siberia and its possibilities, Hollmann (*Mitt. Deut. Landw. Gesell., 27 (1912), Nos. 12, pp. 182–186; 13, pp. 197, 198; 14, pp. 211–214*).—An account of the remarkable growth of the dairy industry in western Siberia since the erection of a dairy at Kurgan in 1893. Data are reported on methods of feeding, cost of milk production, milk yields, and exports of butter.

The dairy Shorthorn, C. Adeane (*Country Life [London], 32 (1912), No. 812, pp. 135–138, figs. 8*).—An account of the development of the English type of Shorthorn, which has been bred for milk production, including a few milk records.

A report of the results of milking trials with 60 cows of the spotted cattle breed of Upper Bavaria, F. Mach and J. Schaller (*Landw. Jahrb., 42 (1912), No. 4, pp. 631–664*).—Methods of feeding and individual records are given.

Three years' work of the Ferndale (Humboldt County) Cow Testing Association, L. Anderson (*California Sta. Bul. 233, pp. 457–482, figs. 10*).—This contains information relating to the formation of cow-testing associations, and gives a detailed account of a successful association in California which has been in operation for 3 years. The first year the average production of 8 herds, containing 581 cows, was 5,900 lbs. of milk per cow. The third year the same herds contained 609 cows, which averaged 6,890 lbs. of milk per cow. The cost of testing is estimated at about $1 per cow per year. An appendix contains the contract and by-laws of the association and a list of the necessary apparatus used in testing.

Cooperative cow testing associations in Iowa, R. K. Bliss, C. R. Bush, and H. F. Luick (*Iowa State Col. Agr. Ext. Bul. 7, pp, 3–72, figs. 16*).—This reports the work of the cow-testing associations in operation since 1909.

The best cow of the 688 tested returned a profit of $106.77, while the poorest cow showed a loss of $19.14. The average profit from the best cow in each of the 46 herds tested was $59.04, and from the poorest cow in each herd $16.63. From the data presented it is estimated that 10 years in a cow-testing association ought to bring all the cows up to 289.2 lbs. of butter fat per year.

Cacao shells as food for dairy cows, J. E. Lucas (*Ann. Sci. Agron., 4. ser., 1 (1912), II, No. 5, pp. 321–347, figs. 4*).—Cacao shells in rations for cows were found to be of less value than would be supposed from an analysis. The results were not conclusive, but there was a tendency on the whole to reduce the amount of milk and increase the amount and percentage of milk fat.

Because less favorable results were obtained than those by Faelli,[a] it is suggested that an astringent principle in the shells may be the cause of the decrease in milk yield. Faelli used fermented shells and the bitter principle may have been destroyed by the fermentation.

[a] Mod. Zooiatro, 9 (1898), p. 403.

Feeding experiments with potato starch refuse and anise seed refuse, 1911–12, N. HANSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 62, pp. 27; K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 6, pp. 386–409*).—Fed in mixtures with protein feeds potato refuse was found to be a good feed for milch cows and swine. In the experiments with milch cows from 1.12 to 1.16 kg. dry matter was found to have the same feeding value as one feed unit. Since the starch refuse contains from 5 to 10 per cent dry matter, from 11.5 to 23 kg. of the wet refuse will equal 1 feed unit.

Experiments with the anise seed refuse indicate that this feed has a similar value for milch cows as small grains, pound for pound. On account of its high content of fat and aromatic principles it should be fed with care and, until more feeding experience is at hand, preferably not in larger amounts than 1 or at most 1.5 kg. per head daily.

Danish experiments concerning the value of soy-bean cake as a food for cows and its influence on the quality of butter, A. MALLÈVRE (*Ann. Sci. Agron., 4. ser., 1 (1912), I, Nos. 2, pp. 81–100; 3, pp. 226–228*).—This is a review of investigations, most of which have been previously noted from other sources.

Lactation in virgins, M. PFAUNDLER (*Ztschr. Kinderheilk., 3 (1911–12), No. 3, pp. 191–205; abs. in Jour. Amer. Med. Assoc., 58 (1912), No. 1, p. 73*).—Analysis of the milk of a virgin heifer is reported. The author reviews other cases, and discusses the mechanism of the phenomenon.

Twenty-fifth annual report of the Bernese Dairy School at Rütti-Zollikofen, A. PETER ET AL. (*Jahresber. Molk. Schule. Rütti-Zollikofen, 25 (1911–12), pp. 130, pls. 16, figs. 9*).—Physical and chemical constants of milk and cheese are reported, and also trials of dairy apparatus and other activities of the school.

Activities of the Swiss Dairy and Bacteriological Institute at Bern-Liebefeld for 1911, R. BURRI (*Landw. Jahrb. Schweiz, 26 (1912), No. 7, pp. 469–491*).—This contains brief reports of studies on the Schardinger reaction, the reducing properties and the bacterial flora of milk, tubercle bacilli in dairy products, and other matters relating to the chemistry and bacteriology of milk.

Chemical composition of milk, V. ZAGARRIO (*Gior. R. Soc. Naz. Vet., 61 (1912), Nos. 19, pp. 432–442; 20, pp. 450–457*).—Analyses of milk are reported, and the influence of breed, lactation period, and other factors affecting the composition are discussed. A bibliography of Italian references on the subject is appended.

The influence of the treatment of milk upon its coagulability by rennet, W. MÜLLER (*Molk. Ztg. Berlin, 22 (1912), No. 45, pp. 530–532*).—The author reports several tests showing that cooling whole milk or skim milk increased the length of time for coagulation in cheese making. In rennet tests the previous treatment of the milk should, therefore, be taken into account.

Studies on the causes of the curdling of milk in stormy weather, A. TRILLAT (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), Nos. 6, pp. 372–374; 9, pp. 613–616; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 5, pp. 1217–1219*).—When samples of milk were exposed to the action of electrified air and to ozone, ammonium nitrate, and nitrous vapors, they did not acidify faster than control samples.

Experiments in reducing the atmospheric pressure under bell jars led the author to believe that reduced air pressure causes the development of gases which promote the growth of lactic acid bacteria. This is further aided by high temperature and moisture in the atmosphere.

Microbes causing decomposition in milk products and margarin, L. N. SÖHNGEN (*Folia Microbiol. [Delft], 1 (1912), pp. 199–248; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 14–16, pp. 331, 332*).—This discusses the species of organisms concerned in the decomposition of fat, and the nature of the chemical changes which take place in its decomposition in milk products.

The significance of infectious vaginal catarrh for milk inspection, H. MESSNER and F. G. KOHN (*Ztschr. Fleisch u. Milchhyg., 23 (1912), No. 5, pp. 99–104*).—Milk from cows affected with contagious vaginal catarrh was found to be lower in amount in specific gravity, solids-not-fat, and index of refraction, but higher in fat content.

The milk question, M. J. ROSENAU (*Boston and New York, 1912, pp. XIV+309, pls. 17, figs. 6*).—This book, which consists of the Harris lectures at Northwestern University in 1912, treats of milk from the standpoint of pure food. Besides a general discussion of the economic importance of milk, various aspects of the problem are considered under the subdivisions of milk as a food, dirty milk, diseases caused by infected milk, clean milk, pasteurization, infant mortality, and milk from farm to consumers. A bibliography of 65 references is appended.

The milk supply, C. CRISTADORA (*Med. Rec. [N. Y.], 82 (1912), No. 21, pp. 941, 942*).—This discusses the food values of milk and the importance of producing sanitary milk, and advocates federal milk inspection.

The sanitary control of local milk supplies through local official agencies, E. J. LEDERLE (*Med. Rec. [N. Y.], 82 (1912), No. 24, pp. 1063–1067*).—This treats of milk problems, with special reference to the problems of milk inspection in New York City.

Prussian milk regulations (*Pub. Health [London], 26 (1912), No. 3, pp. 71–75*).—A translation of work previously noted (E. S. R., 27, p. 575).

The case for pasteurization, E. O. JORDAN (*Jour. Amer. Med. Assoc., 59 (1912), No. 16, pp. 1450–1457*).—The author discusses the danger from raw milk, the advantages of pasteurization and objections thereto, home pasteurization, the necessity for municipal control, and the standard rules of the New York Milk Committee for production, handling, and distribution of milk. The discussion is based largely on the result of investigations in the bacteriology of milk, and throughout the article there are numerous references to original publications.

[Patents granted for sterilization of milk by ultraviolet rays], V. HENRI, A. HELBRONNER, and M. VON RECKLINGHAUSEN (*French Patents 442,807, June 28, 1911; 442,924, July 1, 1911; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 2, p. 1004*).—Brief notes are given on 2 recent patents granted by the French Government.

In one case the milk is raised quickly to a temperature of 60° C. by passing through a heated filter, thus weakening the micro-organisms without affecting seriously the chemical constituents of the milk. It is then submitted to the sterilizing action of the ultraviolet rays by being passed in a thin stream through an apparatus in which it is exposed to the radiations of a quartz mercury vapor lamp, working at 3 amperes and 220 volts. Means are taken to prevent increase in the temperature of the milk.

In the other case the milk is sterilized in the way described above, except that after the heating process it is passed through a homogenizing apparatus, kept at the same temperature, before being submitted to the action of the ultraviolet rays.

The law of economy, H. H. LYON (*Hoard's Dairyman, 44 (1912), No. 22, p. 675*).—A discussion of the inefficient management, extravagant expenditures, and other economic wastes often encountered in large distributing milk plants, which is deemed the cause of the wide margin between the cost of milk production and the retail price of milk.

The milk combine: A contribution to the trust and milk price question, E. MÜLHAUPT (*Volksw. Abhandl. Bad. Hochsch., n. ser., 1912, No. 9, pp. 111*).—It is stated that this book is a chapter from a larger work, "Kartelle und Kartell-

bestrebungen in der Landwirtschaft." It recounts the history and organization of cooperative and other combinations of milk producers and milk dealers. Deductions are drawn concerning the commercial and social significance of the effect of these organizations.

Can veal be profitably produced when milk sells for thirty-two cents per gallon? D. H. OTIS (*Hoard's Dairyman, 44 (1912), No. 20, p. 601*).—This contains estimates on the probable profit and loss in feeding calves when milk is valued at from 10 to 32 cts. per gallon.

On the composition of cream from sheep's milk, G. BIRÓ (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 11, pp. 685–687*).—An analysis of 82 samples of cream from sheep's milk found in the Hungarian markets was as follows: Fat from 21.2 to 46.4, average 37.15 per cent; solids-not-fat 5.01 to 11.69, average 7.64 per cent; ash 0.46 to 0.69, average 0.59 per cent.

Studies on the factors influencing the water content of butter, W. MEIJERINGH (*Studie over de Factoren op het Vochtgehalte der Boter van Invloed. Hague, 1911, pp. 128, pls. 12*).—Data are reported on the fat content of cream, size of fat globules, acidity of cream, duration and temperature of churning and of working butter, temperature and composition of the wash water, and other factors which influence the percentage of moisture in butter.

Report of the annual butter-scoring exhibitions at Hango for 1911 (*Landtbr. Styr. Meddel. [Finland], 1911, No. 83, pp. 42*).—A report of butter inspection, which includes physical and chemical constants as well as the quality of butter as judged by taste, smell, texture, and other characters.

Propagation of starter for butter making and cheese making, E. S. GUTHRIE and W. W. FISK (*New York Cornell Sta. Circ. 13, pp. 4, figs. 2*).—This is a revision of Circular 10, previously noted (E. S. R., 25, p. 281).

The preparation of Fontina cheese (*Gaz. Agr. [Milan], 24 (1911), No. 41, p. 166; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 11–12, pp. 2570, 2571*).—This is a soft cheese which is yellowish in color and usually sold in round shapes, from 22 to 24 lbs. in weight. Formerly it was prepared only in summer from unskimmed milk, but at present it is made during the cold season.

"The unskimmed milk is curdled for half an hour at a temperature of 35 to 38° C. (95 to 100.4° F.). The curd is first broken by a spatula, and then broken up into tiny fragments with a breaker. Then the mass is heated up to 45 to 48° C. (113 to 118.4° F.) for about half an hour, and after three-quarters of an hour of continuous mixing, it is placed in wooden shapes and subjected to moderate pressure. Then follows the process of salting; this, as well as the methods adopted for keeping it, are the same as for Gruyère. After maturing for 2 or 3 months the Fontina is ready. If the cheese has turned out well, it ought to be homogeneous, marked with a few oblong eyes and it should have developed its characteristic odor. If it is kept for 6 months, it becomes firmer, with deeper color, and piquant taste."

Annual report of the cheese making experiment station at Lodi, C. BESANA ET AL. (*Ann. R. Staz. Sper. Caseif. Lodi, 1911, pp. 48*).—This is a report of the activities of the station, including analytical data of the chemical composition of milk and cheese, methods of making cheese, and related topics. Most of the work reported has been previously noted from other sources.

Contribution to the supervision of the trade in yoghourt preparations, C. GRIEBEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 9, pp. 541–557, pls. 3*).—A discussion of results obtained from pure cultures of bacteria taken from commercial preparations of yoghourt.

VETERINARY MEDICINE.

Medical and veterinary handbook (directory) for the Kingdom of Saxony (*Handbuch des Medizinal- und Veterinärwesens im Königreich Sachsen. Dresden, 1912, pp. 150*).—This is a directory of the official physicians and veterinarians in the Kingdom of Saxony, Germany, including both the civil and military branches.

Report of the veterinary surgeon to the corporation of the city of Glasgow for 1911, A. M. TROTTER (*Rpt. Vet. Surg. Glasgow, 1911, pp. 34*).—This report deals with the work done in regard to animal, meat, and dairy inspection in the city of Glasgow in 1911, when 443,533 animals were slaughtered and inspected.

The most frequent disease affecting the animals was tuberculosis.

In addition to this a review is given of the views expressed by authorities on tuberculosis with particular relation to the transmissibility of this disease from bovines to man.

The size of the aorta in warm-blooded animals and its relationship to the body weight and to the surface area expressed in a formula, G. DREYER, W. RAY, and E. W. A. WALKER (*Proc. Roy. Soc. [London], Ser. B, 86 (1912), No. B 584, pp. 39–56*).—"Within a wide range of weight in any given species of warm-blooded animal the sectional area of the lumen of the aorta is proportional to the body surface, and can be calculated from the body weight by means of the formula $A=W^{n}/_{k}$, where n has the value 0.70–0.72 and k is a constant to be ascertained for each particular species."

The size of the trachea in warm-blooded animals, and its relationship to the weight, the surface area, the blood volume, and the size of the aorta, G. DREYER, W. RAY, and E. W. A WALKER (*Proc. Roy. Soc. [London], Ser. B, 86 (1912), No. B 584, pp. 56–65*).—"Within a wide range of weight in any given species of warm-blooded animal the sectional area of the lumen of the trachea is proportional to the body surface, and can be calculated from the body weight by means of the formula $T=W^{n}/_{k}$, where n has the value 0.70–0.72 and k is the constant to be ascertained for each particular species."

Comparative investigations in regard to the agglutinating capacity and complement fixing power of lymph and blood, G. PAGANO (*Ann. Ist. Maragliano, 5 (1911), No. 1–2, pp. 2–6; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 15, p. 1158*).—The lymph (taken from the thoracic duct) of dogs immunized against *Staphylococcus aureus* showed only one-fourth the agglutinating power possessed by the blood of the same animal. Complement fixation was also more marked in the case of the blood. According to this, complement fixing and agglutinating bodies are not formed in the lymph.

Tests to make factors which influence antigens and antibodies visible.—Experimental studies with the epiphanin reaction, H. STÖTTER and E. ROSENTHAL (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 14 (1912), No. 1, pp. 1–13*).—Normal guinea pigs the serum of which does not give the epiphanin reaction (E. S. R., 26, p. 579) undergo certain changes when infected with the tubercle bacillus which can be detected with the reaction. After storing the sera for a long time certain changes take place which make the reaction less definite. According to the author the epiphanin reaction is the most sensitive reagent which we possess at the present time for making visible the relation of the proteins to their respective sera.

About the presence of tæniolysins in immune sera produced by injecting suspensions of tænia, SIVORIA, CORRADI and CAFFARENA (*Ann. Ist. Maragliano, 5 (1911), No. 1–2, pp. 97–103; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No.*

18–19, pp. 776, 777; Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 15, p. 1143).—The sera from subjects infected with *Tænia solium* were tested for the presence of antigens and antibodies. For this purpose a number of proglottids were rubbed up with some quartz sand and physiological salt solution, shaken occasionally, placed in the refrigerator for 24 hours, and then filtered. Rabbits were immunized with the antigen and the serum obtained, when brought into contact with the filtered tænia emulsion, gave a definite precipitate. The authors intend ultimately to use this method for diagnostic purposes.

Diagnosis of anthrax by Ascoli's method, M. P. IZABOLINSKI and B. L. PATZEWITSCH (*Russ. Vrach., 11 (1912), No. 18, pp. 612–616; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 36, p. 672*).—For the test the author utilized three kinds of sera, namely, Ascoli's, one obtained from St. Petersburg laboratory, and one obtained from the laboratory at Tula. The test animals were rabbits and guinea pigs affected with anthrax and other patients having rabies, syphilis, erysipelas, swine plague, tuberculosis and cancer (from man).

The reaction was found to be only specific for anthrax and was most intense when the spleen was used for making the antigen. The antigen extracts were used in dilutions of 1:20 and 1:200. In the last-named dilution a weak ring test was produced, and it takes from 5 to 8 minutes for its occurrence. If the extract is heated to 100° C. and the specific serum to 60° no reaction is produced.

In regard to some new vaccines against anthrax, H. FOTH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 1, pp. 1–22*).—The purpose of this work was (1) to prepare a stable, spore-containing, uniform, and easily standardized vaccine for immunizing against anthrax, and (2) to obtain a strong antiinfectious protective serum against it. Both were obtained. Some immunizing tests with bovine, sheep, and guinea pigs are reported.

In regard to vaccinating against anthrax, N. G. TSCHIRVINSKI (*Arch. Vet. Nauk. [St. Petersb.], 42 (1912), No. 3, pp. 297–300; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 27, p. 495*).—During 1910, gross vaccinations were made in Moscow for the first time by the Pasteur method. The results obtained were unfavorable.

Report on further investigations of the causative agent of foot-and-mouth disease, J. SIEGEL (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 39, pp. 713–718*).—The author here presents in tabular form the results of investigations conducted in continuation of those previously noted (E. S. R., 26, pp. 376, 682).

In 17 of the 18 animals infected by ingestion, subcutaneously, intravenously, or by contact with cytoryctes cocci, the symptoms and lesions of foot-and-mouth disease were produced. In addition to studying the infectiousness of *Cytoryctes aphtharum*, cultivated on artificial media, further studies were made of the biology of this organism.

The examination of the blood in combating glanders, NEVERMANN (*Berlin. Tierärztl. Wchnschr., 29 (1913), No. 1, pp. 8–10*).—As the result of examining the blood from 1,532 horses for glanders, 181 were condemned, and of these 144 were found to be glandered on autopsy. Thirty-seven of the 181 animals, however, were not condemned on the basis of the agglutination and complement fixation tests, although 7 of them were positively glandered. On the basis of the blood tests, 144 horses were condemned and 137 of them were found to have glanders on autopsy. A detailed description of the individual blood tests and a comparison with the findings of previous years are given in the original.

An animal having an agglutination value of 1,000 and no complement fixation reaction is considered sound.

About a new precipitation method for diagnosing tuberculosis, F. MORELLI (*Ann. Ist. Maragliano, 5 (1911), No. 3–4; pp. 196–206; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 15, pp. 1173, 1174*).—The method consists of precepitating the serum protein of the tubercular subject with a specific immune serum.

The phosphatids in the organs of rabbits vaccinated with killed tubercle bacilli, OTOLSKI and BIERNACKI (*Biochem. Ztschr., 41 (1912), No. 5, pp. 375–385*).—A decrease in the phosphatid phosphorus was noted in the kidney, spleen, heart, and lungs, but an increase in the liver. Lecithin (lecithan) phosphorus, however, was decreased in the liver while the jecorin phosphorus was increased.

Jousset's method of demonstrating the tubercle bacillus in pleural fluids, S. R. GLOYNE (*Lancet [London], 1912, II, No. 12, p. 827; abs. in Rev. Bact., 2 (1912), No. 3, pp. 64, 65*).—After stating the results of examining a number of pleural fluids for the presence of *Bacillus tuberculosis*, a modification of the Jousset method, which was employed, is given.

"In most cases only about 5 cc. of fluid were available for examination. Only fluids giving a definite clot on standing were used, no blood serum being added. The digestion was carried out in centrifuge tubes. All digestions were effected at 37° C. Hot carbol-fuchsin was used for staining purposes. The writer recommends the thorough examination of at least a dozen slide preparations before returning a negative result. In some cases other methods of examination were used in comparison. With the Jousset method positive results were obtained in 3 out of 9 cases."

Examination of antituberculous immune sera with the newer sero diagnostic methods, L. SIVORI and G. CONSTANTINI (*Centbl. Bakt. [etc.], 1. Abt., Orig., 66 (1912), No. 1, pp. 124–131*).—Antituberculous sera were tested by the agglutination, precipitation, complement fixation (antigens and antibodies), bacteriolytic in vitro (with and without alexin), and bacteriolytic in vivo (without pretreatment with alexin and with pretreatment) methods. The antitoxic capacity, proteins or toxins, and the opsonic index were also determined. The conclusion reached is that all the methods mentioned above will give valuable information in regard to the activity of the sera under examination, but that it is absolutely necessary to make the bacteriolytic test in vivo in order to judge the therapeutic value of the serum properly.

The formation of prussic acid from linseed cake and other feeding stuffs, S. J. M. AULD (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 289–326, figs. 3*).—The results of the investigations here reported have been summarized by the author as follows:

"The majority of linseed cakes examined produced prussic acid on maceration with water, the amount varying from 0.001 per cent to 0.052 per cent. In only a few cases was no prussic acid formed, owing to the enzym having been destroyed. The 'total' prussic acid content of the cakes examined varied from 0.023 per cent to 0.056; average 0.036 per cent. The rate of generation of hydrocyanic acid varies with different cakes, and is largely dependent on the temperature of incubation. The formation at blood-heat is extremely rapid, half of the available prussic acid being sometimes produced in 15 minutes, and the maximum practically attained within 6 hours. The enzym is easily destroyed by mixing the ground cake with boiling water, and a linseed cake gruel properly prepared with boiling water develops practically no prussic acid, even after 6 hours.

"Yeast and yeast-containing feeds decompose the linseed glucosid and hasten the generation of prussic acid. All the green fodders examined, when in a finely-divided condition, strongly inhibit the formation of prussic acid even

when they contain glucosidoclastic enzyms. The action is chiefly due to their crude fibre or cellulose. Cellulose also inhibits the hydrolysis of amygdalin and salicin by emulsion. The action is caused by the formation of an adsorption compound between the 2 colloids, enzym and cellulose. Salt, glucose, and molasses strongly inhibit the generation of prussic acid. Cane sugar is practically without effect.

"Of the conditions prevailing in the digestive tract, acidity and alkalinity both have inhibiting influence. The digestive enzyms also slightly retard the action by attacking the feeding stuff enzym. The cyanogenetic glucosids phaseolunatin and amygdalin are nontoxic and are not hydrolyzed with the formation of prussic acid in the animal body.

"No fatal poisoning was observed by feeding sheep with linseed cake containing 0.052 per cent of free prussic acid. When well soaked the material is refused by sheep even when hungry, and the moderate quantities taken after keeping the animals without food induce slight poisoning. Death was induced in 2 sheep weighing 50 lbs. and 80 lbs. by 7.8 and 3.9 grains of prussic acid, respectively. These qualities are equivalent in the former case to 2 lbs. and in the latter to 1 lb. of the linseed cake S (0.052 per cent HCN).

"From a due consideration of the results obtained one is forced to the conclusion that when properly administered, linseed cake will have little poisonous action. . . . On the other hand, with the use as a feeding stuff of material capable of producing 4 grains of prussic acid per pound it is obvious that a certain amount of care must be exercised. Thus, fermented, moldy, or yeast-containing foods should be avoided for use with linseed or linseed cake. . . . Gruel which has not been made with boiling water and which has been allowed to stand some time before feeding may well prove extremely dangerous, and, particularly if given to calves which are not in good condition, is probably the cause of the few authenticated poisoning cases which have occurred."

A bibliography of 18 titles is appended.

The formation of prussic acid from linseed cake and other feeding stuffs, S. J. M. AULD (*Jour. Bd. Agr.* [*London*], *19* (*1912*), *No. 6, pp. 446–460*).—This paper relates to the investigations noted above.

Hydrocyanic acid from linseed cake (*Jour. Bd. Agr.* [*London*], *19* (*1912*), *No. 8, pp. 657–660*).—Cold-pressed linseed cake certified to yield 0.038 per cent of hydrocyanic acid was fed to a heifer at the rate of 14 lbs. daily for 8 consecutive days without producing ill effect on the animal. A second heifer was fed a similar amount of hot-pressed cake, certified to yield 0.032 per cent of hydrocyanic acid, for a similar period with like results. It is pointed out that these rations are very much larger than would ordinarily be given and that the linseed cake contained an exceptionally high percentage of hydrocyanic acid.

The results of investigations conducted to determine the effect of heat on the ferment giving rise to hydrocyanic acid in linseed showed that the activity of the enzym upon the cyanogenetic glucosid is the same after the seed has passed through the hot-press process as it was before.

Forage poison in horses, cattle, and mules, so-called cerebro-spinal meningitis and commonly termed "staggers," R. GRAHAM (*Kentucky Sta. Bul. 167, pp. 369–383, pls. 4*).—An outbreak of forage poisoning traceable in a majority of cases to unsound corn, fodder, or fermented ensilage is said to have occurred in Kentucky during the fall and winter months of 1911–12, the heaviest loss being recorded in Kenton, Marion, Henderson, Boyle, Fayette, Warren, Scott, Mason, Marshall, Boone, Pulaski, Shelby, McCracken, Graves, Montgomery, Jefferson, and Fleming counties. Horses were attacked more than cattle, and cattle were more susceptible than mules.

The author states that the course of the disease was so varying that it may be described as occurring in 2 and perhaps 3 types; the acute or rapidly fatal; the subacute, which generally ends in death; and the chronic or milder form from which the animal under proper care and treatment may recover. It was often observed in cattle that the first animal affected in the herd died much sooner than the animals subsequently attacked. Some animals made a complete recovery from a mild or chronic form of the disease only to succumb in a few days or a few weeks' time on a recontraction of the disease, showing that one attack confers no resistance to a second.

The acute form is said to have been more prevalent than any other, especially in horses and mules, the animals so affected succumbing in from 2 to 3 days from the time the first clinical symptoms were manifested. Animals were frequently found dead in the morning that evidenced no symptoms of ill health on the previous day. Horses were attacked at work in the field and died within a few hours. It is stated that the per acute types of the disease have been mistaken for acute poisoning, numerous samples of stomach contents from such animals having been received at the station for examination. The symptoms in a majority of the acute cases were of from 12 to 72 hours standing, while symptoms of subacute cases were of 3 to 9 days duration. The symptoms of the chronic form are mild, such as loss of appetite, dullness, slight incoordination in walking followed by recovery in 2 or 3 days.

In response to a set of questions sent out to veterinarians in the State, reports were received of the deaths of 100 of 134 cows affected, 465 of 612 horses, and 99 of 115 mules. Bacteriological examinations of the brains of several horses and cows gave negative results.

Two veterinarians reported slight success in treating the disease by intravenous injections of a solution of potassium permanganate. The best method of combating it lies in prevention; moldy, improperly cured, fermented, or damaged feed should not be fed to animals. It is stated that at the Elmendorf farm, one of the largest stock farms in this country, where the damaged corn was floated and only sound corn fed, no cases appeared.

Researches on epizootic lymphangitis in Algeria, J. Bridré, L. Nègre, and G. Trouette (*Ann. Inst. Pasteur, 26 (1912), No. 9, pp. 701–726, pl. 1, fig. 1*).—Clinical observations and experimental investigations show that epizootic lymphangitis is transmissible by direct inoculation and that the intervention of blood-sucking insects is not necessary. A study of new lesions shows that the Cryptococcus of Rivolta is not a parasite of the leucocytes. Its morphology and mode of reproduction would indicate it to be of the nature of a blastomycete as do complement fixation tests of the Cryptococcus and certain yeasts. The authors find that salvarsan can be used to advantage in the treatment of the disease, a 1-gm. dose giving better results than larger doses.

Tests of the preventive treatment of strongylosis of ruminants, E. Brumpt and R. Caucurte (*Bul. Soc. Nat. Acclim. France, 59 (1912), No. 12, pp. 361–367*).—The authors' experiments demonstrate the great vitality of the embryos of at least 5 species of strongyles, all of which survived a period of 9 months under unfavorable meteorological conditions. Experiments with preventive medicaments, including coal-tar creosote (1:200), copper sulphite (1:1,000), and iron sulphate (1:1,000), show them to be ineffective. Sheep placed in a park with *Antilope cervicapra* became infested with strongyles from the antelopes.

In regard to the diagnosis of contagious abortion in bovines with the agglutination and complement fixation tests, S. Wall (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), Nos. 1, pp. 23–55; 2–3, pp. 132–160; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 1, p. 7*).—The blood of bovines was

examined, and the earliest indication of impending abortion was noted 3 months before its occurrence. The author considers as a positive reaction one obtained with the agglutination and complement fixation tests with 0.05 cc. of the subject's serum.

Cows which were examined within 6 months after aborting showed a reaction in 93.1 per cent of the cases. In the remaining 7 per cent of the cases the author believes that Bang's bacillus was not the causative factor.

Cows not aborting and over 1 year of age in barns where the disease was prevalent reacted in one-third of the cases, the younger animals in 7.7 per cent of the cases. The male animals in these barns also gave a reaction. In herds apparently uninfected but where abortion occurred sporadically 27.3 per cent of the animals reacted. In many cases where abortion did not occur the animals were infected.

The combined use of the agglutination and the complement fixation reaction is deemed the only certain diagnostic procedure for this disease. The measures for preventing it are discussed in detail.

Infectious abortion of bovines and combating it by vaccination, SCHREIBER (*Abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 45, p. 827*).—To diagnose this disease, the complement fixation reaction and the agglutination tests are considered more reliable than bacterial extracts where the latter are used in the same manner as employed in tuberculosis.

In infectious abortion the condition is often complicated by the presence of the *Bacillus coli*, *B. paratyphosus*, and streptococci, and many of the negative results obtained in attempts to immunize are due to the presence of a coinfection. This has been the case when abortion has been tried as an immunizing agent.

Tests with "Elytrosan" against contagious vaginal catarrh in bovines, SILBERSIEPE (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 46, pp. 849–852*).—According to the manufacturers, Elytrosan is a vaccine prepared from a number of bacteria which are found regularly in the swollen lymph follicles present in contagious vaginal catarrh of bovines.

The tests were conducted with young bovines ranging in age from 20 to 24 months and calves from 6 to 8 months old. Only such animals as were strongly affected were considered in the tests. None of the animals treated with the preparation were cured, despite the fact that each received 4 injections using a total of 80 cc. of vaccine.

The frequency, significance, and specific diagnosis of bovine tuberculosis, M. KLIMMER (*Beitr. Klinik Tuberkulose, 19 (1912), No. 3, pp. 431–449, figs. 2; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 4 (1911), No. 9, p. 460*).—In Germany, according to the figures obtained in meat inspection, 21 per cent of the cattle were tuberculous, and in Saxony alone 40 per cent. The results of the tuberculin tests indicated that 80 per cent of the adult bovines and 40 per cent of the calves are tuberculous. On the basis of the results obtained by the meat inspection, the losses from tuberculosis in Germany are about 20,000,000 marks ($4,760,000) annually.

In diagnosing tuberculosis with the conjunctival reaction from 1 to 7 per cent, with the subcutaneous test 8.5 per cent, and with the intracutaneous test from 25 to 30 per cent of false reactions were obtained. The cutaneous and dermal reactions are not considered reliable. The thermic reaction gave usable results with bovines, equines, goats, sheep, pigs, dogs, rabbits, and guinea pigs, but not with chickens or turkeys. The conjunctival test, which is given the preference, is of value for bovines, equines, and dogs, but not for rabbits, guinea pigs, chickens, or turkeys, and will not tell the activity of the tubercular process. The agglutination, precipitation, Calmette cobra venom reaction, and

complement fixation tests are of no value for detecting tuberculosis in bovines in general practice.

Studies on the virus of hog cholera, W. E. KING and F. W. BAESLACK (*Jour. Infect. Diseases, 12 (1913), No. 1, pp. 39–41*).—This is a preliminary report of investigations made on hog cholera with the dark field illumination.

Spirochetes were found with uniformity and constancy in the blood of every hog examined affected with hog cholera. The spirochetes which could readily be distinguished from bacteria and blood filaments were relatively large, 5 to 7 microns in length and 1 micron in width, and the body was flexible, and round and blunt at the ends. They were actively motile and revolved about their longitudinal axes, the motility was undulating in character, and the spirals were fixed. Several of the organisms were observed dividing longitudinally. In one permanent microscopical mount prepared by india ink fixation, one of the organisms showed a polar flagellum.

"To date 33 hogs have been under observation, 130 dark field examinations have been made, and permanent microscopical preparations of the organism in the Bureau of Animal Industry, Indiana, and Rochester strains of virus have been secured. . . .

"The data thus far collected in this investigation are limited and do not warrant the formation of definite conclusions as to the etiological significance of the findings."

In this work the fresh blood of normal and diseased hogs was collected aseptically in a sterile sodium citrate solution.

The ultrafiltration of the filterable viruses, L. VON BETEGH (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 52, pp. 969–973, figs. 3*).—After giving a short résumé of the advances made in microbiology with reference to the diseases caused by filterable viruses, the author describes the various forms of ultrafilters and their use. Some of the apparatus is illustrated, especially the Bechhold disc collodion filter.

In some tests with the virus of hog cholera (emulsions of heart blood, kidney, spleen, and lung tissue), it is shown that an ultrafiltrate can be obtained which if injected into shoats will not produce hog cholera. The organisms (?) were evidently retained in the filter. According to this, the viruses which we term "filterable" are not filterable, and the question of filterability is entirely dependent upon the kind of filter used. The unfiltered virus, when examined with the dark field illumination, was found to contain among other organisms, small, strongly refractile bodies and spirochete-like formations. When the virus was cultivated on agar at 37° C. for 24 hours, many coli, bipolar, and *Bacillus suipestifer*-like organisms were obtained.

Diagnosis of hog erysipelas with the Ascoli thermoprecipitin reaction, J. ZAGAJA (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 45, pp. 822–824*).—These tests were made with 28 hogs which died from erysipelas and 10 sound animals. In most of the instances spleen extracts were employed in the tests and were prepared according to Ascoli's specifications.

The results show that in all cases the tests substantiated the findings with the microscope and bacteriological tests. The pathological material (spleen) gave a stronger reaction as it grew older although a lung which gave a very positive reaction at first gave a negative one after 71 days.

Tests in regard to forced immunization.—**The preparation of antihog erysipelas**, I. G. EUGEN (*Arch. Vet. Nauk. [St. Petersb.], 42 (1912), No. 5, pp. 433–435; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 31, p. 569*).—Tests were conducted with the horse for the purpose of determining whether an antiserum could be prepared in less than from 3 to 3½ months. The author con-

cludes that an active immune serum can be obtained by forced immunization in about 2 months' time.

Tuberculosis in the horse, LIÉNAUX (*Ann. Méd. Vét., 61 (1912), No. 12, pp. 653–659*).—The author noted in the course of the year 1912 4 horses affected with tuberculosis.

Tuberculosis in fowls, SCHLEGEL (*Mitt. Ver. Bad. Tierärzte, 12 (1912), No. 6, p. 85; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 52, p. 977*).—A description of 5 cases of tuberculosis in fowls.

Some poultry diseases met with in Colorado, B. F. KAUPP (*Colorado Sta. Bul. 185, pp. 3–30, figs. 20*).—This is a summarized account of the more important diseases of fowls which occur in Colorado and the treatment therefor, with a brief discussion of methods of detecting hens with diseased ovaries, and nonlayers due to other causes.

RURAL ENGINEERING.

Automatic irrigation, F. DE CONDÉ (*Jour. Agr. Prat., n. ser., 23 (1912), No. 23, pp. 722, 723, figs. 3*).—An investigation is reported of a new system of automatic irrigation for truck gardens having a pressure supply and a main supply pipe feeding parallel laterals.

The supply in each lateral is controlled by an automatically operated spigot. An auxiliary pipe fed by the lateral below its supply spigot fills a bucket so suspended by a system of cables and pulleys that when it is full it sinks by its own weight, thereby shutting off the supply spigot on the lateral over which it operates, and opening the supply spigot on the next lateral which in turn repeats the operation. The filling of the bucket is so timed by a spigot on the auxiliary pipe that when it is full sufficient water has been supplied to that particular lateral. Each lateral is supplied with spray nozzles, each nozzle covering a radius of about 6 meters, and from 140 to 150 sprays are provided per hectare. The cost of installation is about 4,000 francs per hectare (about $320 per acre).

Drainage in South Carolina, constitution and by-laws of the South Carolina Drainage and Levee Association, E. J. WATSON (*Dept. Agr., Com. and Indus. [S. C.] Bul. 25, 1912, pp. 16*).

Modern road construction, F. WOOD (*London, 1912, pp. XI+137, pls. 2, figs. 25*).—This book gives in concise and comprehensive form the leading characteristics and details of modern roads and improved methods of road construction, and contains chapters on macadam roads; wear of roads; effect of traffic on roads; tarred roads; bitumen; methods of using tar and bitumen; rollers and rolling; paving; and cost of maintenance.

Road legislation and administration in Iowa, J. E. BRINDLEY (*Iowa State Col. Engin. Expt. Sta. Bul. 28, 1912, pp. 112*).—This bulletin deals with the history of roads in Iowa and the Iowa State Highway Commission; makes a comparative study of road legislation in the various States; and gives a large amount of statistical road data.

It presents the conclusion that a state road and bridge law should embrace in general the following: The civil township should be the unit of local government for the construction and maintenance of secondary roads. A township road superintendent should be appointed by the township trustees, and approved by the county engineer. The county is a large enough taxable area to secure the necessary funds for the construction and maintenance of its own primary roads, culverts, and bridges. A county engineer should be appointed by and made directly responsible to the county board of supervisors. The state high-

way commission should be granted large powers and authority, and the appropriations for its support should be substantially increased. The construction and maintenance and the letting of contracts for country roads and bridges should be done under the supervision of the county engineer subject to suggestions by the state highway commission. The tax on automobiles should be used as a state aid fund for the construction and maintenance of permanent highways. All property road taxes should be paid in cash. The supervision and control of public highways should be a township, county, or state function in proportion to the relative amount of tax levied for that purpose by those respective jurisdictions.

Some recent tests to determine effects of grade and surface of roads on tractive force (*Engin. and Contract., 38 (1912), No. 19, pp. 515, 516*).—This notes and gives tables of results of tests on dirt, cinders, macadam, asphaltic concrete, and brick as used in country roads to determine the effects of grade and the surface condition on tractive force. In these tests 4 teams averaging 2,617.5 lbs. in weight and accustomed to hauling heavy loads were used with a traction dynamometer wagon provided with 8 sets of wheels ranging from 1§-in. tires up to 6-in. tires and carrying loads of brick equivalent in weight to average heavy loads of about 8,000 lbs.

The results indicate that on roads constructed of the above materials a well-trained team can exert a tractive force of from one-fifth to one-fourth of its weight through a distance of practically 1 mile on the level, a tractive force of from one-fourth to slightly over one-third of its weight for a distance of 500 ft. on the level, and on macadam a tractive force of from one-third to nearly one-half of its weight up a 5 per cent grade for a distance of 500 ft., and that on a dirt road a team can pull on a 10 per cent grade only two-ninths of the load that it can draw on the level.

The conclusion is that in determining the permissible grade it is necessary to take into consideration the probable weight of the load to be hauled, the average type of horse, and the effect of atmospheric conditions, particularly of rain, on the chosen road materials, in their relation to draft and footing for the horse.

Progress reports of experiments in dust prevention and road preservation, 1911 (*U. S. Dept. Agr., Office Pub. Roads Circ. 98, pp. 47*).—The details of methods pursued with the cost data and analyses of materials used in experiments conducted during 1911 are reported, together with supplementary reports on the existing physical conditions of experimental roads constructed in 1908, 1909, and 1910 previously noted (E. S. R., 25, p. 592).

On Connecticut Avenue extended at Chevy Chase, Md., about 3,300 ft. of experimental road was constructed in 7 sections, using refined coal tar, fluxed native asphalt, Gilsonite oil asphalt, and oil asphalt by the penetration method in 6 sections, and by the modified Gladwell method in the seventh. The completed thickness of all sections was approximately 8 in. of compacted material. This road is subjected to a wide range of heavy traffic. The average cost per square yard of the road was $1.3584; for the bituminous surfaces by the penetration method the cost was from 46.18 to 68.22 cts. per square yard, and by the modified Gladwell method 64.42.

On Bradley Lane, Chevy Chase, Md., 2 experiments in surface treatment of macadam were conducted in 4 sections; 3 with refined semiasphaltic oil and one with molasses lime, consisting of a mixture of 150 gal. molasses, 360 lbs. lime and sufficient water to make 450 gal. The cost of the oil surface treatment on 2 sections was 21.58 cts. per square yard, and 14.51 cts. per square yard on the other. The molasses lime treatment cost 2 cts. per square yard.

This surface was inspected 1 month after treatment and still showed evidence of having been treated.

At Jamaica, N. Y., in cooperation with the Bureau of Highways, Borough of Queens, New York City, about 2,000 ft. of experimental resurfacing work was done in 9 sections, using oil cement concrete in one section and oil asphalt, tar, and fluxed native asphalts by both the mixing and penetration methods in the others. A traffic census covering a period of 11 days showed an average of 1,493 vehicles for a period of 24 hours passing over this road after completion. The surface presented an excellent appearance when inspected after 4 months' use. The oil cement concrete section was made in 2 experiments, the first costing $1.2859 per square yard, and the second $1.2843 per square yard. The bituminous binder sections by the mixing method cost from $1.2083 to $1.4229 per square yard, and by the penetration method from $1.2009 to $1.3309 per square yard.

In Ithaca, N. Y., in cooperation with Cornell University, 4 experimental sections were constructed using oil asphalt, refined asphaltic preparations and refined coal tar by both the penetration and mixing methods. These sections were later inspected and presented uniformly smooth, well bonded surfaces with one exception where raveling had set in over the entire width of a large strip of oil asphalt surface. This was repaired by removing all the old material and reconstructing by the penetration method, using clean stone from 1 to 2 in. in size and about 2 gal. of bitumen per square yard. The cost of this work was excessive owing to crude apparatus, unskilled labor, and the small size of the work.

The supplementary reports of existing physical conditions of previously constructed experimental sections at Ithaca, N. Y.; New York City; Ridgewood, N. J.; Washington, D. C.; Boise, Idaho; Ames, Iowa; Knoxville, Tenn.; Youngstown, Ohio; Newton, Mass.; Garden City, Dodge City, Bucklin, Ford, and Independence, Kans.; and Bowling Green, Ky., show with few exceptions fairly satisfactory results.

Third annual report of the Association for Standardizing Paving Specifications (*Ann. Rpt. Assoc. Standard. Paving Specifica., 3 (1912), pp. 192, figs. 7*).—A report of the proceedings of the third meeting of this association.

Proceedings of the fifteenth annual meeting of the American Society for Testing Materials (*Amer. Soc. Testing Materials Proc., 12 (1912), pp. 600, pls. 4, figs. 42*).

Energy and velocity diagrams, P. L. JOSLYN (*Cincinnati, 1912, pp. 70, pls. 3, figs. 49*).—This book deals both technically and practically with the use and layout of gas engines, giving chapters on technical terms; energy and velocity diagrams; indicator cards; diagrams of inertia, pressure, and tangential effort; diagrams for gas blowing engines; for the main bearing and crosshead guide pressures; for single acting gas engines; and 2 final chapters on the derivation of formulas.

Comparative fuel values of gasoline and denatured alcohol in internal-combustion engines, R. M. STRONG and L. STONE (*U. S. Dept. Int., Bur. Mines Bul. 48, 1912, pp. 243, pls. 3, figs. 32*).—This bulletin gives a large amount of experimental data and results of investigations of mechanical efficiency, mixture, quality, time of ignition, character of ignition spark, jacket-water temperature, speed of engine, load variation, mixtures with water, and compression in the use of alcohol and gasoline in internal-combustion engines.

The results indicate in general the following: The price of denatured alcohol is greater than that of gasoline, and the quantity of denatured alcohol consumed by an alcohol engine, as ordinarily constructed and operated, is in general relatively greater than the quantity of gasoline consumed by a gasoline engine

of the same type. Alcohol gives in general a somewhat higher efficiency and causes smooth running, but due to its comparatively high vaporization point difficulty is ordinarily experienced in starting. The efficiency with which gasoline can be used is limited by the comparatively low compression necessary, and the combustion of gasoline takes place much more rapidly than that of alcohol, thus tending to cause a more rapid rise of pressures in the cylinder and a less smooth running.

Future investigations of liquid fuels in internal-combustion engines are to be reported in a later bulletin.

The cost of the operation of motors in Montevideo, O. KASDORF (*Rev. Inst. Agron. Montevideo, 1911, No. 8, pp. 139–184, tables 9, pl. 1, figs. 7*).—Results of comparative tests of the economy of steam and electric motors, kerosene, naphtha, benzin, producer gas, Diesel, and natural gas motors for agricultural use are reported.

They indicate that for a total time of operation of 3,000 hours per year the electric and gas motors are the most economical up to 5 h. p., the Diesel motor is the most economical from 5 h. p. to 50 h. p., and the producer gas motor from 50 h. p. to 100 h. p. For a total time of operation of 1,500 hours per year the results were about the same except that the Diesel motor gave the greatest economy from 10 h. p. to 100 h. p. The most allround economy was obtained from the producer gas motor and the Diesel motor. A large amount of experimental data accompanies the report.

[The evolution of the new working tools adapted to motor cultivation], K. DE MEYENBURG (*Genie Rural, 1912, No. 40, pp. 1–13, figs. 35*).—This report, presented before the Congress of Motor Cultivation at Amiens, deals with the history of cultivating tools, and gives the results of original investigations, from technical and economical standpoints, of their development and improvement in their application to motor cultivation. Results are given of tractive resistance tests as affected by the character and condition of the soil and surface, showing the effect, on efficiency and economy, of improvements in the machinery in regard to stability, weight, simplicity, easy running, etc.

[Hand-driven cream separators] (*Sachs. Landw. Ztschr., 60 (1912), No. 44, pp. 590–594, figs. 2*).—Test results of 2 hand-driven centrifugal cream separators, one of small size and the other larger, show a rapid separation of milk and cream, the smaller separating an average of 117 kg. of milk per hour and the larger 298 kg. The process of taking apart, cleaning, and putting together of both machines was easily and quickly accomplished, and the data of driving power required indicate that an average 12-year-old child may easily operate the smaller machine and an average woman the larger.

Elementary mechanical refrigeration, F. E. MATTHEWS (*New York, 1912, pp. IX + 172, figs. 43*).—This book deals in a brief and comprehensive manner with the principles involved, the purposes, and the methods employed in mechanical refrigeration. Chapters are given on cold and its production; the development of mechanical refrigeration; commercial systems of refrigeration; the compression system; simple comparisons; ice-making systems; the installation and operation of refrigeration systems; working pressures; cleaning the system; capacity of refrigerating machines; and cold storage duty.

Potato warehouse plans, R. M. DOLVE (*North Dakota Sta. Bul. 101, pp. 26, figs. 9*).—This bulletin deals with the warehouse as a strong economic feature in the potato growing industry and illustrates and outlines the details of construction of an inexpensive potato cellar of the roofed pit type, a warehouse of the basement type, and a warehouse providing storage in both basement and superstructure.

It particularly describes the installation and operation of the mechanical sack elevator, and considers as important factors in construction, temperature, ventilation, soil drainage, convenience, durability, and cost.

The cost of a large first-class potato warehouse is estimated at about 10 cts. per bushel of its storage capacity.

Working plans of Cornell poultry houses, C. A. Rogers (*New York Cornell Sta. Circ. 14, pp. 5–24, figs. 29*).—This circular contains working plans and a brief explanation of several types of approved poultry houses and appliances, which for the most part have been discussed in a previous publication (E. S. R., 23, p. 395).

Stable mangers and racks, M. Ringelmann (*Jour. Agr. Prat., n. ser., 23 (1912), No. 22, pp. 687–689, fig. 1*).—The author gives the results of investigations and tables of data of the dimensions of stalls, mangers, and hayracks to accommodate the average sizes of the different kinds of horses and mules. He bases his computations on the height from the ground to the withers of the animal and multiplies this height by constants for each dimension, these being obtained by experimenting on an average size of each type. For an average stall to accommodate an average-sized animal of any of the kinds experimented with, it is concluded that the dimensions should be computed from an average height to the withers of about 1.35 meters (about 5.3 ft.).

Sewage works for institutions, country houses, and small hamlets, H. M. Wilson (*Jour. Roy. Sanit. Inst., 33 (1912), No. 10, pp. 460–467, figs. 2*).—The results of experiments and investigations by the author of small sewage works indicate that the septic tank should have a capacity equal to 36 hours' flow, and should be at least 5 ft. deep. The inlet and outlet pipes should dip 2 ft. under the water level in the tank to prevent disturbance. The tank should be constructed of impervious material and the floor should slope to one corner to facilitate cleaning. The filter floor should be impervious and have a considerable slope to an outfall channel and a false floor of broken stone, brick, or tile should be provided to prevent the escape of fine filtering material. The filtering medium should be broken stone, gravel, slag, or clinker, not less than 3 or more than 6 ft. deep, and should be set in layers carefully graded from coarse to fine material. The size of filter should allow at least 1 cubic yard of filtering material for every 50 gal. of sewage flow. A system of butt-joint field pipes should be laid level in herring-bone fashion over the filter surface for distribution of the effluent.

Detailed plans of experimental septic tanks and filters accompany this report.

Country house sewage purification, J. E. Tuke (*Jour. Roy. Sanit. Inst., 33 (1912), No. 10, pp. 468–474*).—The results of investigations by the author of small sewage purification plants indicate that for reducing the possibilities of air pollution, the ordinary ferro concrete or wooden covers to the settling tank, in conjunction with shallow trays, formed of small mesh expanded metal and filled with a layer of peat-moss litter over the filter bed, will be sufficient. The trays should be above the discharge pipe from the tank so as to check the escape of foul air. For the disposal of sludge in small plants the ordinary septic tank has been found lacking, so it is recommended that semiseptic tanks after the plan of the hydrolytic, Emscher, or Dortmund tanks be installed in which the 90 to 95 per cent of liquid sewage can be treated in aseptic condition and the whole septic action be utilized solely for the purpose of breaking down and digesting the solids.

The capacity of such a tank in relation to average daily flow should be as small as possible, consistent with an adequate scum-forming capacity, and the depth should be great in relation to its area. Since the mechanical means of distribution employed in large systems clog up and befoul the air when used in

small systems, it is suggested that the tank effluent be discharged into a series of serrated edged channels or troughs fed intermittently from the tank which may be made to revolve or travel over the filter by mechanical or hydraulic pressure.

RURAL ECONOMICS.

The land, the people, and the state, G. PARKER and R. DAWSON (*London, 1910, pp. 258*).—This volume contains a number of observations relative to the decline of agricultural operations in England, including a discussion of land ownership, tenancy, credit, and other agricultural problems, and contrasting them with corresponding problems in other countries.

Agricultural conditions in the United States, M. J. NAGEL (*Monatsch. Landw., 5 (1912), No. 12, pp. 353–362*).—This article presents observations concerning the agricultural operations and rural economy in the United States, based largely on census figures.

First annual report of the Better Farming Association of North Dakota, T. P. COOPER (*Ann. Rpt. Better Farming Assoc. N. Dak., 1 (1912), pp. 18*).—This association began active work November 15, 1911, its object being as stated to disseminate information and instruction in modern scientific methods as applied to agriculture, to bring about a more general practice of permanent and profitable forms of agriculture, and to develop the phases of farm life which will better rural agricultural conditions generally.

The plan of the work as formulated consists of demonstrations and advisory farm management work. The work is financed jointly by counties or districts making fixed appropriations for a period of at least 3 years, and the association appropriating an equal sum, raised by contributions from business interests, for a similar period. The work was organized on a little over 12 per cent of the farms in 12 counties last year, there being 2,346 farm cooperators joining in the work. The expenditures amounted to $43,110.70.

The following table illustrates some of the increases in yields reported from the first year's work as due to better tillage methods, improved varieties of grain, and the use of better seed:

Yields per acre in field demonstrations compared with locality and State averages.

Crop.	Acres under demonstration.	Reported yield per acre.		
		Demonstration fields.	Locality average.	State average.
		Bushels.	*Bushels.*	*Bushels.*
Corn	2,520	42	30.5	26.7
Wheat	1,172.3	23.2	18.5	18
Oats	783	59	57	41.6
Barley	828	39.25	31.3	29.7
Flax	1,118.6	15	11.5	9.7
Potatoes	196.2	142.7	105.9	128

The young farmer: Some things he should know, T. F. HUNT (*New York and London, 1912, pp. 280, pls. 15*).—This volume calls attention to a number of subjects with which a successful farmer should be familiar and discusses them under the following headings: Means of acquiring land, farm organization, opportunities in agriculture, size of farm, selection of farm, rotation of

crops, equipment, how to estimate profits, cost of farming operation, the place of intensive farming, farm labor, marketing, laws affecting land and labor, etc.

The formation of prices of food commodities and prime necessities, A. DULAC (*La formation des Prix des Denrées Alimentaires de Première Nécessité. Paris, 1911, pp. 158*).—The author of this volume presents a rather thorough analysis of the theory of prices and the mechanism of markets, devoting considerable attention to an analysis of the difference between the producer and the consumer and their economic relationship to each other, at the same time making some observations regarding the difference between raw materials and the finished product, and the different forces at work when they are sold or placed on the market.

The German grain tariffs, L. BRENTANO (*Die Deutschen Getreidezölle. Stuttgart and Berlin, 1911, 2. ed., rev., pp. 124*).—The author in this volume presents in a historical way the causes and conditions leading to the establishment of an alliance between the agrarians and manufacturers in 1878, resulting in the protective tariff on German grain in 1879.

A considerable portion of the book is devoted to pointing out and illustrating some of the advantages and economic drawbacks of these duties. It is noted that under the tariff policy grain imports were held in check to an extent by an increasing intensity of cultivation, but the author argues that the increased intensity was not due to the duties, but to increased technical efficiency. Among other conclusions he finds (1) that the duties did not cause a suspension of imports nor prevent a further decline in prices; (2) that the profits by reason of the tariff went exclusively to 19 per cent of the farming population, chiefly large landowners, the small farmers producing insufficient grain for use on the farm; and (3) that grain duties had no tendency to render German agriculture capable of competition with other countries.

Among other effects of the tariff he observes that the duties on the 4 principal grains cost each consumer an average of 19.91 marks (about $4.74) annually, thus making the bread tax from 1 to 7 per cent of the usual family income. This he claims tended to check the use of the less indispensable commodities and increase drunkenness. He further observes that crime and grain prices rose and fell together.

Is the tenant getting a fair share of the farm income? O. LEE, Jr. (*Tribune Farmer* [*N. Y.*], *12* (*1912*), *No. 580, pp. 6, 7*).—This article illustrates the possible inequality of income to tenant and owner arising from contracts on the half share system, and shows the importance of both tenant and proprietor keeping accurate and careful records that they may know how to establish a sound basis for a division of the income.

The author discusses and points out some of the merits and defects of the share system and gives a concrete illustration to show the inadequacy of the half share system; in this case the tenant planted 20½ acres to potatoes, producing 4,061 bu., which when sold brought the proprietor and tenant each $965.49. The proprietor's share of the expenses for labor, seed, fertilizers, farm expenses, taxes, interest, insurance, etc., amounted to $467.56, and the tenant's share to $760.11, making a net profit to the proprietor of $497.93, and to the tenant, $205.38. It is noted that a variation in yield or price would not change the proportionate receipts of the two parties, although it might, by going low enough, reduce the account to a point where the tenant would actually lose money while the proprietor would still make a profit.

Other tables are given showing how cost of production and other expenses may be more evenly distributed between tenant and proprietor, and suggesting, in addition, a lease which would distribute the farm income more evenly between each.

[Agricultural credit], TROSIEN (*Der Landwirtschaftliche Kredit und seine Durchgreifende Verbesserung. Berlin, 1911, pp. 84*).—In addition to a number of general observations regarding agricultural credit and indebtedness, the author discusses in this volume special conditions as they exist in Prussia, especially legal limitations of mortgage indebtedness in relation to the taxable value of lands, and suggestions for securing credit for agricultural purposes at lower rates of interest. He combats the theory that it is an economic disadvantage to have the mortgage indebtedness on land constantly increasing, holding that agricultural development demands an increase of circulating capital and also of fixed capital in addition to the value of the land, and that this additional demand necessarily and justly leads to an increase of agricultural credit and indebtedness, provided such increase does not exceed the proportionate increase in the value of the land. It is further noted that the increase in land values does not increase circulating capital, as argued by some, but that it increases indebtedness and reduces the circulating or operating capital. This the author attributes to the fact that the agricultural population, as a rule, does not grow richer in the same proportion in which farm lands increase in value, and that whenever the land changes hands, which is at least once in a generation, the increased value means that a larger amount of fixed capital must be put in land value. This amount is usually taken from circulating capital, and the larger credit which this increased land value permits does not affect operating capital but only places a higher charge upon agriculture.

To meet the necessity for larger and cheaper credit the author suggests the substitution of short-time personal credit in the place of the usual mortgage credit.

[Insurance against agricultural accidents], PHILIPSEN ET AL. (*Ber. Arbejderforsik. Raadets Landbr. Afd., 1911, pp. 27; Bilag 1, pp. 197; 2, pp. 54*).—This is a report of the agricultural section of the Workmen's Insurance Council of Denmark for the year 1911, in which the latest statistics relative to the operation of the insurance laws of 1908, as applied to agricultural accidents, are presented.

The total number of accidents in agricultural work in 1911 among compulsorily insured laborers reported was 2,312 as against 1,978 in 1910 and 550 in 1909. Of the voluntarily insured 197 cases of accidents were reported in 1911 as against 118 in 1910.

In order for an injured person to receive any compensation under the law permanent incapacitation must exceed 10 per cent of his normal working power. Of the total number of injured compulsorily insured in 1911 only 666 were granted compensation, the remainder only being temporarily incapacitated. The compensation amounted to 425,340 crowns ($113,991). Tables are given showing a classification of accidents according of their consequences, age of victim, and causes.

Report bureau of labor statistics of Iowa, E. W. VAN DUYN ([*Bien.*] *Rpt. Bur. Labor Statis. Iowa, 15 (1910–11), pp. XIII+415, pl. 1*).—A department of farm labor was added to the Iowa bureau of labor during 1911 for the purpose of supplying information to farmers wanting farm hands or persons desiring farm work, and during the short period that this branch was in operation 175 requests were received for farm hands and about an equal demand from men wanting work. From the number of letters received from parties that have secured places on the farm the bureau is convinced that it is justified in making this department a permanent branch of its work.

Farm crops (*Bur. of the Census* [*U. S.*] *Bul., Agr. U. S., 1910, Abs.—Farm Crops, pp. 59, figs. 8*).—This bulletin presents in condensed form by States and geographic divisions the main results of the Thirteenth Census of the United

States with reference to the acreage, production, and value of crops in 1909 and 1899, together with data as to relative importance of individual crops, relation of prices to increase in values, the purchase and sale of crops, and expenditures for labor and fertilizers.

The total value of all the crops in the United States in 1909 is reported at $5,487,000,000, as compared with $2,990,000,000 in 1899. This was equal to $59.66 per capita of the population of the United States in 1909 as compared with $39.46 in 1899, or to an average of $863 per farm in 1909 as against $523 in 1899.

Supply and distribution of cotton, W. M. STEUART and H. J. ZIMMERMAN (*Bur. of the Census* [*U. S.*] *Bul. 115, 1912, pp. 31*).—This bulletin presents data relative to the supply of cotton in the United States for the year ended August 31, 1912, and its distribution together with statistics of spindles, cotton consumed, cotton on hand, and imports and exports of cotton and other goods, including statistics for previous years.

Data are further given as to the world's spindles and consumption of cotton for 1900 and 1912, together with statistics of the trade in cotton and cotton manufactures for selected countries. The aggregate of the figures included in the preliminary quarterly report for the year showing supply and distribution of cotton is also given. See also a previous note (E. S. R., 26, p. 490).

Live stock products and domestic animals sold or slaughtered on farms (*Bur. of the Census* [*U. S.*] *Bul., Agr. U. S., 1910, Abs.—Live Stock Products, etc., pp. 16*).—According to this bulletin there were on the farms in the United States in 1900 16,069,000 dairy cows, producing 5,814,000,000 gal. of milk. The total value of dairy products on farms in 1909, exclusive of milk and cream consumed on the farm, is reported at $596,413,000. The reported farm production of butter and cheese in 1909 was 994,650,610 lbs. and 9,405,864 lbs. respectively, as compared with 1,071,626,056 lbs. and 16,372,318 lbs. respectively in 1899. The combined farm and factory production of butter was 1,619,415,263 lbs. in 1909 and 1,491,752,602 lbs. in 1899, the factory production alone having increased 48.7 per cent. The production of cheese on farm and in factory increased 7.4 per cent during the decade, a much greater proportion being made in factories, 94.5 per cent in 1899 and 97.1 per cent in 1909.

Tables are given showing corresponding data by States and geographic divisions, also data as to wool and mohair, poultry and eggs, honey and wax, and domestic animals sold or slaughtered on the farm.

AGRICULTURAL EDUCATION.

Preliminary report on conditions and needs of rural schools in Wisconsin ([*Madison, Wis.*], *1912, pp. 92*).—This report of a field study by the Training School for Public Service to the Wisconsin State Board of Public Affairs, recommends among other things (1) the appointment of a supervisor of agriculture and a supervisor of domestic arts who shall be members of the staff of the state superintendent, and agricultural inspectors, some of whom should be members of the faculties of county schools of agriculture; (2) that contests in agriculture and home economics be encouraged by the state department of public instruction; (3) that the training of teachers of agriculture and home economics be encouraged by the offer of free scholarships, (4) that the curriculum of the county training schools should include increased instruction in agriculture and farm accounting; (5) that the school manual should be revised, strengthening the courses in agriculture and adding courses in manual training and domestic art; (6) that the principals of rural schools of the first class should be engaged for a whole year, should be qualified to teach agricul-

ture, should supervise the work of the boys in agriculture during the summer months on plats on the home farms, and conduct extension work among the adults in the community; and (7) that one of the assistants should be similarly employed to teach home economics and conduct summer extension work among the girls and adults of the community.

Suggested solutions for some rural school problems in South Carolina, W. K. TATE (*Bul. Univ. S. C., 1912, No. 28, pt. 6, pp. 43*).—In addition to the suggested solutions, this bulletin also indicates briefly the lines of effort which the state supervisor of elementary rural schools has been pursuing.

The readjustment of a rural high school to the needs of the community, H. A. BROWN (*U. S. Bur. Ed. Bul., 1912, No. 20, pp. 31, pls. 7*).—Some influences that have a bearing upon the evolution of the rural high school are discussed, a description of the school buildings with equipment is given, and the four lines of work (college preparatory, commercial, agricultural, and domestic arts), maintained by the Colebrook Academy at Colebrook, N. H., are outlined.

Agriculture at a high school, H. F. BUTTON (*Rural New Yorker, 71 (1912), No. 4177, pp. 1153, 1154, figs. 2*).—Since the introduction of vocational subjects into the agricultural high school at Manassas, Va., 4 years ago, the number of pupils has increased from 30 to 75. Ninety per cent of the students completing the eighth grade enter the high school, and practically all of the graduates enter college or go to normal schools. Seldom a day passes when several people do not seek technical advice from the agriculturist as to such topics as milk and cream testing, testing cows for tuberculosis, spraying, pruning and grafting trees, seeding, alfalfa, mixing fertilizers, and preparing balanced rations for live stock. There are about 250 members of an unusually well-attended farmers' institute organized 4 years ago with the agriculturist of the school as secretary, and besides the regular meetings, 3 corn shows, a poultry show, 2 four-day meetings, and a field demonstration of spraying have been held. Nearly $20,000 has been expended in the construction of a new building and the purchase of 12 acres of land, of which 5 acres are used for demonstration plats and the remainder for lawns and playgrounds.

The teaching of agriculture in the schools of Ontario (*Ontario Dept. Ed. Circ. 3, 1912, pp. 4*).—This circular briefly reviews the progress in agricultural education in Ontario since 1847, and outlines the agencies at present at work for promoting the teaching of agriculture in its schools.

Agricultural education (*West Indian Bul., 12 (1912), No. 2, pp. 221–230*).—The following papers on agricultural education, presented at the session of the West Indian Agricultural Conference, are briefly summarized and discussed: Agricultural Education in Grenada, with Special Reference to the Secondary School for Boys, by D. H. Jones; on the Report of the Trinidad Committee on Agricultural Education, by W. G. Freeman; The Need for Higher Agricultural Education in the West Indies, by Dr. A. Fredholm; A Lectureship in Tropical Agriculture, by S. Simpson; and Peasant Agriculture in Grenada: Suggestions for its Control and Improvement, by G. G. Auchinleck.

Report of the office of inspection of agricultural education and promotion in 1909, M. DEL CAMPO HERRERA (*An. Agron. [Santiago de Chile], 5 (1910), No. 1–2, pp. 1–26*).—A discussion of the reorganization of the practical schools of agriculture in Chile is followed by brief accounts concerning the attendance, funds, and equipment, of the practical agricultural schools at Santiago, Talca, Cauquenes, Chillan, and Concepcion, and brief reports on the work of the district agronomes, the section of streams and forests, the veterinary hospital, station of vegetable pathology at Santiago, and piscicultural stations at Rio Blanco and Dehesa.

Agricultural schools and itinerant instruction under the control of the Chamber of Agriculture (*Jahresber. Landw. Kammer Prov. Posen, 1911, pp. 106–117*).—This is a report for 1911 on the various phases of agricultural instruction in the Province of Posen, Germany.

Where the brains come from, J. W. R. SCOTT (In *A Free Farmer in a Free State. London, 1912, pp. 91–103, pls. 4*).—This is an account of the organization of agricultural instruction in the Netherlands.

Higher and secondary colonial agricultural instruction, G. B. C. VAN DER FEEN (*Cultura, 24 (1912), No. 289, pp. 330–354*).—Detailed information is given concerning the development of higher and secondary colonial agricultural instruction in the Netherlands.

[Agricultural and forestry instruction in Austria and other countries] (*Land u. Forstw. Unterrichts Ztg., 26 (1912), No. 1–2, pp. V+150+LXVI*).—This number is devoted mainly to (1) special articles noted elsewhere in this issue; (2) statistics of agricultural education institutions in Austria for 1911–12, showing an increase of 2 institutions over the previous year; and (3) a review of agricultural literature. An appendix gives the organization lists of the faculties of the agricultural education institutions in Austria.

Agricultural winter schools in Switzerland and Austria, L. FREIH. V. HENNET (*Mitt. Fachberichterstat. K. K. Ackerb. Min. [Vienna], 1912, No. 11, pp. 85–88; Land u. Forstw. Unterrichts Ztg., 26 (1912), No. 1–2, pp. 94–103*).—A discussion of measures for increased agricultural production is followed by a brief statement of the organization of agricultural instruction in Switzerland and a comparison of the Swiss agricultural winter schools with those in Austria.

Agricultural report for 1910 (*Landtbr. Styr. Meddel. [Finland], 1910, No. 82, pp. 216*).—This is a comprehensive report on the work done during the year by the education and research institutions supported by the Finnish Government for the advancement of agriculture in its various branches.

Reorganization of itinerant agricultural instruction and the supervision of agriculture in France, L. FREIH. V. HENNET (*Land u. Forstw. Unterrichts Ztg., 26 (1912), No. 1–2, pp. 104–107*).—An account is given of the present system of itinerant agricultural instruction in France and of the provisions of a project for its reorganization now under consideration by the government.

The Australian aspect of agricultural education, H. W. POTTS (*Reprint from Rpt. Austral. Assoc. Adv. Sci., 13 [1911], pp. 553–559*).—The author points out the value of a better educated agricultural population to the prosperity of the Australian commonwealth, and indicates what has been done in this direction by outlining briefly various phases of the system of agricultural education.

[Some results of agricultural extension in foreign countries], J. HAMILTON (*Penn. Dept. Agr. Bul. 222, 1912, pp. 61–63*).—This address, given at the annual meeting of the Pennsylvania State Board of Agriculture, outlines the Belgian plan of agricultural extension, and enumerates some of the financial results brought about during the past 25 years through the efforts of the experts employed.

Manual of general agriculture, E. P. TERRY (*Los Angeles [1912], pp. 115, figs. 16*).—The experiments in this manual represent actual work done by the author's classes during several years' teaching of the subject of general agriculture in high schools. There is sufficient material to occupy the laboratory time of a high school class at least 4 periods a week for 1 year. The general subjects considered are physical and chemical properties of soils, chemistry of plants, agricultural botany and plant propagation, enemies of crops, and testing milk and its products.

A laboratory manual of agriculture for secondary schools, L. E. CALL and E. G. SCHAFER (*New York, 1912, pp. XIV+344, figs. 29*).—The laboratory work of this manual is outlined by months—September to May—and is intended for secondary schools giving a year's instruction in agriculture. A detailed list of equipment needed in the 82 exercises is given in the appendix.

Productive farming, K. C. DAVIS (*Philadelphia and London [1912], 2. ed., pp. VIII+374, pl. 1, figs. 223*).—In this second edition (E. S. R., 26, p. 691) a chapter on cotton production has been added.

Dry land farming, T. SHAW (*St. Paul, 1911, pp. XXX+460, pl. 1, figs. 54*).—Special consideration is given in this text to the crops that may be successfully grown in the various sections of the dry land area of the United States, and to the best methods of growing them. Some attention is also devoted to the maintenance of soil fertility and live stock farming.

Chapters in elements of agriculture (*Agr. Ed. [Kans. Agr. Col.], 3 [1911], Nos. 12, pp. 27, figs. 8; 13, pp. 19, figs. 15; 14, pp. 30, figs. 8; 15, pp. 23, figs. 13; 16, pp. 31, figs. 10; 17, pp. 23, figs. 4*).—These are lessons intended primarily for teachers of agriculture in Kansas. They include a soil primer, by L. E. Call, with 6 lessons, each followed by suggestions for practical demonstrations and reference literature; plant propagation, by J. C. Cunningham, in which 18 laboratory exercises are outlined; a dairy primer, by O. E. Reed; a poultry primer, by F. S. Jacoby, each lesson being followed by a list of review questions; a corn primer, by E. G. Schafer, with 8 lessons, each followed by suggestions for exercises; and a wheat primer, by L. A. Fitz, of 7 lessons.

Biology, H. W. CONN (*Boston, New York, and Chicago, [1912], pp. X+425, figs. 149*).—This text is intended to serve as an introductory survey of the laws which apply to both animals and plants, and those principles which coordinate and correlate them. Outlines of the correlative laboratory work and books of reference have been added at the end of the chapters, and a glossary-index is appended.

Laboratory work in applied chemistry for students in domestic science, A. HENWOOD and F. H. GRIFFIN (*Philadelphia; Drexel Inst., 1912, pp. 62, figs. 2*).—This manual consists of exercises on (1) detergents and chemicals employed in the laundry, (2) air and its examination, (3) heat, and (4) food materials. The principle of the method or the object of the experiment, the apparatus required, and details of procedure are outlined in the exercises, and many of them are followed by review questions.

Instruction in agricultural plant breeding, K. FRUWIRTH (*Land u. Forstw. Unterrichts Ztg., 26 (1912), No. 1–2, pp. 1–27*).—This is a discussion of the organization of instruction in agricultural plant breeding, its present status in the higher agricultural education institutions, especially in Germany, Switzerland, and Austria, the purpose of the instruction, whom it serves and where it should be given, and subject-matter in plant breeding for higher and secondary agricultural education institutions and for short courses.

The author concludes that to enable students at a higher agricultural education institution to master the theoretical fundamental principles, special lectures of one hour a week should be given during the year. To give a complete and thorough course would require from two to three lecture periods and from two to three practicums a week. An insight into the principles of plant breeding, with which the majority of students at the higher and secondary agricultural education institutions are concerned, can be given at the higher agricultural education institutions either in the general subjects of the special lectures on plant breeding or by the introduction of practicums in plant breeding in the lectures on agronomy. The latter is also the only feasible plan for

the secondary agricultural schools. Eight lecture periods and from 3 to 4 practicums are deemed sufficient in the higher institutions for this instruction, which merely gives a knowledge of the essentials and importance of agricultural plant breeding. Special one-week courses for practical farmers should have special reference to practical demonstrations, knowledge of species, and plant diseases, and may be given at plant breeding institutions cooperating with farmers or at higher agricultural or seed breeding institutions.

Standardization of instruction in forestry (*Forestry Quart., 10 (1912), No. 3, pp. 341–394*).—This report of the Committee of the Conference of Forest Schools, deals exclusively with the standardization of a course for advanced professional training. The need for at least 4 different grades of training is recognized: (1) Advanced professional training, to include not only a substantial general education but also a well rounded course in all branches of technical forestry; (2) instruction for forest rangers, requiring merely a common school education, and conducted mainly along thoroughly practical lines; (3) general instruction in forestry supplementary to a course in agriculture, and designed to assist owners in the handling of their own woodlands; and (4) a general course in conservation and forestry designed for those who wish, as a part of their general education, to have some information on the economic problems involved.

The general educational requirements and the technical courses essential in a high grade school and the number of hours accepted by the educational conference as the minimum time to be devoted to each course are given.

Ranger schools, H. S. Graves (*Forestry Quart., 10 (1912), No. 3, pp. 395–398*).—The author maintains that the instruction should be secondary in character, located in the forest, and cover a period of one year. The curriculum outlined includes among other subjects elementary surveying, forest measurements, dendrology, silviculture, forest protection, forest products, lumbering, law, forest administration, construction work, and camp outfitting.

Timely organization of instruction in machinery and implements at secondary agricultural schools, V. Frenzel (*Land u. Forstw. Unterrichts Ztg., 26 (1912), No. 1–2, pp. 28–38*).—The author discusses the purpose, subject-matter, and method of theoretical and practical agricultural instruction in machinery and implements for secondary agricultural schools in Austria.

Some types of children's garden work, Susan B. Sipe (*U. S. Dept. Agr., Office Expt. Stas. Bul. 252, pp. 56, pls. 11, figs. 2*).—This is a report on some phases of children's garden work, based upon observations made in Pittsburgh, Pa.; Cleveland, Ohio; Chicago, Ill.; Minneapolis, Minn.; Greeley, Colo.; Utah State Normal Training School; California; Portland, Oreg.; and Spokane, Wash. Special emphasis is given to those aspects dealing with the relation of the garden to daily living, its effect upon character development, its place in the curriculum, and its relation to other subjects in the course of study. Outlines are included of the nature-study courses in Chicago and Los Angeles.

School gardening—some cautions, E. C. Bishop (*Nature-Study Rev., 8 (1912), No. 8, pp. 297–300*).—It is pointed out that a school garden needs a careful, faithful, able, and preservering overseer during its entire career. No school garden should be started unless it has a specific function or is to meet a particular need, such as that of an experimental plat to be used in connection with the school or home work; beautifying the school grounds; providing outdoor activity; affording an intimate study of processes or products; and furnishing products needed by the school, the pupils, or their homes.

Quality of product and appearances are regarded as essential to success. "Dwarfed, faded, shabby vegetables and flowers; third-rate fruit and sickly

experimental plants; carelessly made rows and weedy patches; neglected cultivation and careless handling—many or all of these reflect failure on the part of pupils, teacher, school, and last upon the school garden."

Boys' and girls' clubs, E. B. BABCOCK, W. G. HUMMEL and F. L. GRIFFIN (*California Sta. Circ. 80, pp. 8*).—The purposes of such clubs, sources of help for them, and work which they may undertake, are briefly outlined. Suggestions for organizing agricultural club contests are also given.

Sweet pea growing clubs, F. L. GRIFFIN (*California Sta. Circ. 81, pp. 2–16, figs. 2*).—The object in forming these clubs is to see who can grow and exhibit the most beautiful collection of sweet peas. Directions for organizing and conducting these clubs, together with the best methods of sweet pea culture and a suggestive score card for judging a sweet pea exhibit are given.

Special contests for corn club work, O. H. BENSON (*Jour. Ed.* [*Boston*], *76* (*1912*), *No. 14, pp. 373–375*).—This article describes how to conduct corn contests in seed selection, stringing, testing, judging, and breed and variety naming.

Knapp Agricultural Day (*Washington, D. C.: Knapp Memorial Committee*, [*1912*], *pp. 16*).—This pamphlet explains the purpose of this day and gives a suggested program, including biographical and bibliographical data.

MISCELLANEOUS.

Twenty-fourth Annual Report of Massachusetts Station, 1911 (*Massachusetts Sta. Rpt. 1911, pts. 1, pp. 287, pls. 3, figs. 8; 2, pp. 90, figs. 2*).—Part 1 of this report contains the organization list, a report of the director, a financial statement for the fiscal year ended June 30, 1911, reports of heads of departments, and numerous special articles abstracted elsewhere in this issue.

Part 2, which is the portion designed for general distribution, consists of papers of a popular nature based on the results of observations and experiments of the station, and of a brief summary by the director of the more important conclusions from the articles. In addition to the papers abstracted elsewhere in this issue, a description is given by G. E. Stone of A Notable Elm Tree (pp. 69–71) and a discussion by the same author entitled Do We Need a Seed Law in Massachusetts (pp. 75–77).

Eighteenth Annual Report of Montana Station, 1911 (*Montana Sta. Rpt. 1911, pp. 107–137, figs. 4*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1911, a report of the director on the work and publications of the station, and a meteorological summary of temperature, precipitation, wind direction, sunshine, and frost conditions at Bozeman, Mont., during the year.

Experiment Station Work, LXXII (*U. S. Dept. Agr., Farmers' Bul. 517, pp. 24, fig. 1*).—This number contains articles on the following subjects: Promoting the germination of seed, cotton anthracnose, asphaltum treatment for the peach-tree borer, raising and finishing beef calves on the same farm, open-shed feeding of steers, profitable systems of dairy farming, market eggs and their improvement, uses of the sweet potato, vinegar making from waste grapes, and lighting farmhouses.

NOTES.

Alabama College and Station.—Dr. E. P. Sandsten has been appointed professor of horticulture in the college and horticulturist in the station, vice P. F. Williams, deceased. Jesse M. Jones, formerly assistant in animal industry and subsequently in the employ of this Department, has been appointed professor of animal industry in the college and animal husbandman in the station, vice D. T. Gray, resigned to accept a position with the North Carolina Station.

California University.—Under the direction of the division of agricultural education an extension course in elementary agriculture, with university credit, is being given to a class of over 45 teachers in the Los Angeles Normal School. The division is also offering a series of 5 lectures to 4 high schools in the State. The attendance thus far has been good and has included many farmers residing in the vicinity of the schools.

Connecticut College and Storrs Station.—The *C. A. C. Lookout* announces that Dr. C. D. Jarvis has been appointed director of agricultural extension work in cooperation with this Department, and that he has severed his connection with the station.

Illinois University.—The registration at the annual corn growers' and stockmen's convention, commonly known as the "short course," has been far ahead of any previous records. At the close of the first week there were 937 registered, including those in household science, as compared with 595 and 700 in the corresponding dates in 1911 and 1912 respectively. Ninety-three boys attended, their way being paid by their respective counties.

A portrait of Isaac Funk, the well-known breeder, was admitted to the Illinois Hall of Fame January 22.

Purdue University and Station.—Smith Hall, the new dairy building, is expected to be completed by May 1. The front portion is a two-story stone and brick structure, with reenforced concrete floors and tile roofing, and devoted to offices, lecture rooms, and laboratories. It is to be connected with a one-story commercial creamery, 118 by 72 feet.

Iowa College.—G. M. Wilson has been appointed at the head of the department of agricultural education. He is a graduate of the Indiana State Normal School and the Indiana State University, has received his master's degree from the university, and is now taking advanced work at Columbia. He has had 15 years' experience in public school work in Indiana as county school teacher, county superintendent, and city superintendent, and was among the first of the county superintendents to introduce agricultural work into the public schools and encourage the consolidation of rural schools.

An Iowa Agricultural Experiment Association has been recently organized and is distributing improved strains of seeds for testing.

Kansas College.—A board of three members, consisting of E. T. Hackney of Wellington, Mrs. J. M. Lewis of Kinsley, and ex-Governor Hoch of Marion, has been appointed by the governor under a recent state law which establishes a single board of control after July 1 in place of the separate boards of regents for the agricultural college, the state university, and the state normal school.

Massachusetts College.—Frederick L. Yeaw, assistant professor of market gardening, resigned February 14 to engage in commercial work. Miss Laura

Comstock, associate professor of home economics in the University of Maine, has been appointed in charge of home economics work in the extension department, and will enter upon her new duties July 1 with courses at the summer school.

Michigan College.—According to an investigation recently conducted, 40 per cent of the agricultural graduates from the college during the past three years returned directly to farms, 45 per cent have been employed to teach agriculture in the colleges and high schools or to engage in experimental work, and 7.5 per cent have engaged in occupations allied to agriculture, so that only 7.5 per cent have taken up work unconnected with agriculture.

Since the winter of 1897 the college has sent back to Michigan farms approximately 2,600 men, and the present session will add about 325 men. The State now has 25 high schools offering courses in agriculture, nearly all of which are in charge of graduates of the college.

Minnesota University.—John G. Williams, of Duluth, has been appointed to the board of regents, vice Henry B. Hovland, resigned.

Nevada University.—The first farmers' short course in the State was offered February 18 to 28.

New Mexico College and Station.—Two demonstration trains have recently been sent out over the lines of the El Paso and Southwestern Company and the Santa Fe System.

L. R. McNeely, a 1912 graduate of the University of Missouri, has been appointed assistant agronomist to carry on work in soil physics.

New York State Station.—Frank H. Hall, editor and librarian, has also been appointed vice director. Other appointments include Robert S. Breed (Ph. D., Harvard) as bacteriologist, vice Dr. H. A. Harding, whose resignation has been previously noted; and Alfred Kimball Burke, a graduate of the University of Maine, as assistant chemist.

Cornell University.—Ground will be broken this spring for the proposed animal husbandry buildings. These consist of a three-story and basement main building, to cost $91,000, and a one-story judging pavilion, 160 by 80 feet, to cost $38,000. The main building will include in the basement laboratories for milk testing and meat curing, a farm slaughtering room, and experimental breeding rooms for small animals. The remaining floors will contain a lecture room, with a seating capacity of about 300, with smaller lecture rooms, laboratories, offices, etc. The judging pavilion will seat about 500 people and it is said that it will be the largest at any agricultural college.

Prizes have recently been offered by the proprietor of a certified milk farm for a clean milking contest. This will be open to students taking milking practice in the animal husbandry course.

Leslie E. Hazen, of the dry land investigations of this Department, has been appointed assistant in farm mechanics, beginning February 15. W. J. Robbins, of Lehigh University, and J. K. Wilson, of the New York State Station, have been appointed assistants in plant physiology.

Ohio State University.—The college of agriculture is asking for $42,000 for additional farm lands, $1,000 for the horticultural laboratory, $17,000 for general equipment, $75,000 for a horticultural and forestry building, and $50,000 for extension work. T. L. Wheeler, editor of the extension department, has resigned to become editor of the *Farmer's Guide*, with which he was formerly connected.

Pennsylvania College and Station.—Carl W. Larson, assistant, has been appointed professor of dairy husbandry and dairy husbandman, vice H. E. Van Norman, whose resignation has been previously noted.

Texas Station.—Dr. H. Schmidt, a graduate of the college and for five years a student of veterinary medicine in the Imperial Veterinary College in Berlin, has been appointed assistant veterinarian, devoting his entire time to research work. L. C. Ludlum has resigned as assistant chemist and has been succeeded by H. B. Spaulding.

Virginia College.—Five agricultural scholarships of $250 a year for four years have been offered by the Southern Railway System. Boys in the counties of Virginia traversed by the lines of the Southern, Virginia and Southwestern, and Danville and Western railways are eligible on a competitive basis, high school credentials counting 75 points and farm experience 25 points. The holders of the scholarships must agree to devote at least three years after graduation to practical farming along these railway lines, to teaching agriculture, or to working on an experimental farm in some State traversed by the system.

J. D. Eggleston, of the rural education service of the United States Bureau of Education, has been chosen president of the institution.

Virginia Truck Station.—A substation has been established at Tasley, and H. S. Garrison, a recent graduate of the Delaware College, has been appointed superintendent beginning February 1. J. E. Pickett has resigned as horticultural foreman at the main station.

Washington College and Station.—R. W. Thatcher has announced his intended retirement as director of the station and head of the department of agriculture in the college at the close of the academic year. H. B. Humphrey, head of the department of botany in the college and plant pathologist in the station, has resigned to become physiologist in charge of the cereal disease investigations of this Department and has been succeeded by Dr. Ira D. Cardiff as head of the department of botany in the college and of the division of plant pathology and physiology in the station. C. W. Deming has resigned and has been succeeded by Dr. C. L. Huff as professor of meat inspection in the veterinary school.

West Virginia University and Station.—The recent session of the legislature changed the fiscal year from October 1 to July 1, and made appropriations to July 1, 1915. A total of $80,000 was granted for extension work in agriculture, horticulture, and home economics for this period, and the station received $10,000 for promoting horticulture, $4,500 for live stock investigations, $2,500 for tobacco investigations, and $4,500 for printing.

The legislature passed an act establishing an agricultural extension department in the college of agriculture and giving it charge of all extension work in agriculture and home economics, including the management of the farmers' institutes which have heretofore been conducted by the State Board of Agriculture. It also established a state crop pest commission, composed of the director of the station as chairman, the commissioner of agriculture, and the president of the State Horticultural Society, with the station entomologist as ex-officio state entomologist. The law is modeled very largely upon that of Virginia, and $10,000 per annum is appropriated for its enforcement.

Wisconsin University.—It is noted that of 196 recent requests to the university for men specially prepared for teaching and research work in agriculture, four qualifications were especially in demand. These were (1) broad general preparation, (2) sufficient maturity to command the respect of farmers, (3) familiarity with farm practice and farm life, and (4) successful experience both in teaching and farming.

Certificates of recognition for their services to agriculture were awarded at the recent annual ten-day farmers' course to H. W. Collingwood, editor of the *Rural New Yorker*, the late O. H. Kelley, founder of the Patrons of Husbandry,

and Henry D. Griswold, a prominent Wisconsin farmer. In recognition of his work in developing horse breeding, Dr. A. S. Alexander has been presented with two bronze horses, made by George Ford Morris, illustrating respectively the points of an ideal draft horse and the defects of an inferior one.

Wyoming University and Station.—The legislature has approved a permanent tax levy of three-eighths mill for the university, and has granted $10,000 for extension work and $1,000 to use for spreading mange among coyotes.

University of the Philippines.—Recent appointments include C. F. Baker as professor of agronomy, E. A. Glodt as associate professor of agricultural engineering, and F. C. Gates, as instructor in botany. Dr. H. N. Whitford has resigned as associate professor in forest botany and silviculture.

Seale Hayne Agricultural College, Devonshire.—The foundation stone of a new agricultural college, provided in a bequest of the late Charles Seale Hayne, Member of Parliament for Mid-Devon, was recently laid by President Walter Runciman of the Board of Agriculture and Fisheries. About $500,000 is available for the institution, of which $100,000 is to be utilized for buildings and the remainder as a fund for administrative purposes. An estate of over 200 acres near Newton Abbott, Devonshire, has been obtained as a site. The institution is to provide agricultural instruction and will also become a research center for the region. Accommodations are being provided for about 50 students.

Agricultural Work of the University of Bristol.—Steps are being taken at this university to increase materially its activities in agricultural education and research. The university has recently become associated with the National Fruit and Cider Institution, established near Bristol in 1903 to carry on investigations in fruit culture and cider making, and will receive an annual grant of $12,500 from the Development Commission for research in fruit growing and fruit diseases. The university will also obtain $25,000 additional from the Development Commission for the purchase of land and the erection of laboratories and other buildings, and has raised a like amount from other sources for these purposes. It is also carrying on investigations in the chemistry of Cheddar cheese, and on the teart or scouring land, and is to become an official center for a group of western counties in providing technical advice to farmers.

B. T. P. Barker has been appointed director of the department of agricultural and horticultural research. Other recent appointments include A. H. Lees as plant pathologist, C. T. Gimingham as agricultural chemist, and Otto Grove as enologist.

Irrigation and Drainage in Argentina.—An office of irrigation and drainage has been established in the Argentine Ministry of Agriculture for the purpose of studying problems and methods of irrigation and drainage, questions concerning the conservation and use of water powers, and methods of farming without irrigation in subhumid, semiarid, and arid regions. Studies are also to be made of the influence of afforestation on climate and water supply, and the legal and economic aspects and relations of all the different lines of work are to be given consideration.

Fifth Annual Corn Exposition.—This exposition, which was held at Columbia, S. C., January 27 to February 8, was of large educational significance. A total of 67,000 square feet of floor space with a liberal annex, filled with exhibits of about 25 agricultural colleges and experiment stations and what was probably the largest exclusively agricultural exhibit this Department has ever sent out, tended to make the exposition the greatest strictly educational enterprise pertaining to agriculture ever held in the South.

The exhibit of this Department consisted of three carloads of illustrative material, occupying 8,000 square feet of floor space. Nine branches were repre-

sented, including the Forest Service, the Weather Bureau, the Nutrition Investigations of this Office, the Office of Public Roads, and the Bureaus of Animal Industry, Plant Industry, Soils, Entomology, and Chemistry. One feature which attracted much attention was a cattle dipping tank with which daily demonstrations in tick eradication were given.

Some very striking exhibits were also made by many of the agricultural colleges and experiment stations, as well as by other educational institutions. The station exhibits for the most part dealt especially with some one important phase of their work. Thus, Cornell gave special prominence to plant breeding, Kansas to animal husbandry, Rhode Island to the use of lime and other fertilizers, and Ohio to soil fertility. A model rural community center from Illinois attracted much attention, as did an exhibit by Winthrop College of three model farms for southern conditions. Much prominence was also accorded the boys' corn clubs and girls' tomato clubs.

Miscellaneous.—A new journal of plant breeding, *Zeitschrift für Pflanzenzüchten*, is being issued at Berlin under the editorship of Dr. C. Fruwirth, with L. Kiessling, H. Nilsson-Ehle, K. von Rümker, and E. von Tschermak as associate editors. The journal is the official organ of the German Society for the Advancement of Plant Breeding and of the Austrian Society of Plant Breeding. Original articles, memoirs, and reviews are to be published, and contributors are invited to send articles to Prof. Dr. C. Fruwirth, Waldhof bei Amstetten, Austria.

Officers for 1913 were elected by the American Phytopathological Society at its Cleveland meeting, as follows: President, F. C. Stewart, Geneva, N. Y.; vice president, Haven Metcalf, Washington, D. C.; secretary-treasurer, C. L. Shear, Washington, D. C.; and councillor, W. J. Morse, Orono, Maine. The next meeting is to be held at Atlanta, Ga., in conjunction with the American Association for the Advancement of Science.

Charles H. T. Townsend has been appointed by the Peruvian Government director of entomological stations as well as governmental entomologist. A central station of agricultural entomology is already established in temporary quarters at Lima and the branch station in the Department of Piura is to be continued for the investigation of cotton insects.

Walter Fischer, formerly of the Office of Seed and Plant Introduction of this Department, has accepted a position with the Argentine Government and will be located at Pergamino, where a 400-acre experimental station is being conducted under the direction of J. H. Cameron.

E. C. Green, who has been in charge of the plant introduction investigations of this Department in southern Texas for several years, has been appointed in charge of a dry-land cotton station at Coroatá, Máranhao, Brazil.

Dr. Carl G. P. De Laval, widely known as the inventor of the cream separator, died February 3, at Stockholm, aged 67 years.

Fernand David has succeeded Jules Pams as minister of agriculture in France.

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EXPERIMENT STATION RECORD.

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The movement for the promotion of agriculture through public agencies has grown very rapidly in the United States in recent years and is constantly broadening its scope. Large amounts of public funds are now used in this way and there is incessant demand for increased appropriations for old and new enterprises. So strongly has the public mind been drawn to the desirability of improving our agriculture and the conditions of country life that legislatures are more and more liberal in their attitude toward propositions for adding to the work of the State along agricultural lines.

Naturally attention has thus far been chiefly centered on the merit, or at least the attractiveness, of the individual propositions which involved the expenditure of public funds. Relatively little attention has been given to the broader questions regarding the best organization of the agricultural work of a State as a whole, or the relations which the various branches of the State's agricultural agencies should sustain toward each other. The tendency, therefore, has been for each agency to push its claims independently and to endeavor to increase its importance by broadening the scope of its work at every opportunity.

As long as the field was thinly covered and the aggregate of funds employed was small, this tendency attracted little attention. Growth, therefore, went on sporadically, and the competition of institutions was on the whole regarded merely as an indication of their healthy activity. Now, however, administrative officers and legislators and, to a certain extent, the general public are awakening to the fact that our agricultural institutions are not organized on any consistent plan and that they exhibit much heterogeneity of functions and actual overlapping of work. The competition among them has become more insistent and disagreeable, and their demands are more complex and embarrassing.

Meanwhile a general movement has arisen which looks to the standardization of public and private business on a new basis of efficiency and economy. Agricultural business and agricultural insti-

tutions are being inevitably drawn within the purview of this movement. Already there has been general legislation enacted with a view to the more economical use of public funds that has incidentally affected the operations of agricultural institutions, and in some cases it has been clearly revealed that this legislation had been drawn with little or no consideration of the peculiar requirements of such institutions.

A point has now been reached where it behooves the friends of agricultural advancement, and particularly those who are actively engaged in the promotion of enterprises for such advancement, to consider carefully and broadly what is involved in the organization of a complete system of agricultural promotion through public agencies and how the branches of this system may be best governed and limited.

Naturally the first outcry against the existing order of things is that there is waste of public funds through duplication of work. To remedy this it is often proposed to bring all the agricultural agencies of a State under a single control and to make the dominating feature of this control the business or financial management of the institutions, regardless of their character and purposes. Or the effort is made to separate the financial from the general management and commit the former to a special officer or board. Or a general board is created to manage all the educational agencies of the State, or certain groups of institutions, which may be of a miscellaneous character.

Thus, a recently enacted law in Kansas puts under a state board of administration, with three members, the state university, six normal schools, the agricultural college, and schools for the deaf and blind. A comprehensive measure now pending before the Ohio Legislature proposes to create an agricultural commission with four members, which shall have under its control all the administrative business of the State relating to agriculture, and also the agricultural college of the state university and the hitherto separate agricultural experiment station. To this is added the supervision of weights and measures and the enforcement of laws relating to birds, fish and game, drugs, and the practice of pharmacy.

In some States existing legislation by its exact language or by the interpretation of the courts puts the agricultural college and experiment station in the general class of charitable institutions, or makes applicable to them provisions primarily intended to control the business of reformatory and penal institutions.

In a few cases the States have made provision for studies of the problems affecting their agricultural institutions through temporary or advisory commissions. In North Dakota a temporary educa-

tional commission, created by an act of the legislature, was empowered to study educational systems in the United States and elsewhere "with a view to the presentation of a report which will form the basis for the unifying and systematizing of the educational system of this State, and thereby provide for the removal of unnecessary duplication of courses in the institutions of the State, as well as to suggest such legislation as will tend to prevent any unseemly competition among the institutions for appropriations."

This commission consisted of the presidents of the state university, agricultural college, and normal school; superintendent of public instruction; lieutenant governor; speaker of the house of representatives; and one other member appointed by the governor. After a year's study the commission made a report, in which, among other things, it stated that as regards the university and the agricultural college, "the conditions existing in North Dakota at the present time relative to the matter of duplication and rivalry are not serious." It recommended the continuance of separate boards for the management of these institutions, and asked for a continuance of the commission, because "any considerable legislation that may be undertaken in the future should be based upon a careful study of the situation in all directions by educational experts," and the commission "does not feel that it has any more than entered upon the general phases of the problem."

In New York a state advisory board has been established "in relation to the promotion and direction of agricultural education and the advancement of country life." This consists of 12 members, including the commissioners of education and agriculture; directors of the agricultural college, experiment station, veterinary college, and three agricultural schools; a member of the state fair commission; and three members appointed by the governor. Annual reports are made to the governor. A recent report dealt with the teaching of agriculture in the secondary schools, and was made the basis of a message by the governor to the legislature, recommending the conclusions of the board to their "most friendly consideration."

Inasmuch as our agricultural institutions have thus far been developed without any thorough study of their appropriate functions, there is a bewildering variety in the organization and work of institutions in different States established under the same general title. When attempts are made to study their status with reference to changes in their organization, and especially to transfers of work from one institution to another, it is natural for each institution to defend its present status. Under existing conditions it is comparatively easy for any one institution to get a large amount of comparatively biased opinion from the managers of other institutions to

support almost any view of the proper organization and work of such institutions. The result is that the minds of legislators and the public in any State are confused regarding these matters and are unable to determine whether there are really any fundamental principles by which their opinions and action may be safely guided.

The advisability of concentration of effort in education is a many-sided question. The assumed advantage in the direction of economy, through which the strongest popular appeal is usually made, is often more theoretical than real, and works out to the doubtful advantage of the student. There is a recognized limit to the number of students that can be satisfactorily handled by an instructor in a section, especially in laboratory and shopwork, and there is likewise a limit to the number who can be accommodated with given facilities. The crowding of students in practice work, either by too large numbers in the sections or too close succession of classes, is only justified by necessity.

In most of our state colleges and universities the instructors are already overworked, and the existing facilities are taxed to the utmost, or rapidly tending in that direction. The expense of providing additional facilities and teaching force to meet the growing demand will not differ materially whether this be done at one or at several institutions, nor will the cost of maintenance. Furthermore, the advisability of assembling very large bodies of students on a single campus is one on which there is pronounced difference of opinion, and is at least an open question.

While there is undoubtedly unwise and unnecessary duplication and overlapping in isolated instances, the size and rapid growth of some of the large States emphasizes the advantages and the reasonableness of a certain amount of multiplication of institutions, and their maintenance should not prove a hardship. Educational institutions are not to be likened to factories and can not be financed and managed on the same basis as commercial enterprises. The public needs to understand this distinction, as well as the broad functions of such institutions, and the fact that greater economy and efficiency will not necessarily follow concentration. On the whole, wise regulation is a matter of greater importance, and will very often serve to correct the evils which are aimed at through combination. The first effort must be to develop strong institutions, which will serve the interests of the State ably and effectively; and it may well be considered whether the experience of the Eastern States, where institutions have multiplied and have likewise developed in strength and influence, points to extreme concentration as a logical plan of development.

Before there can be any satisfactory solution of the problems of organization and work confronting our agricultural institutions,

serious effort must be made to secure a reasonable consensus of opinion on the part of those justly entitled to be considered competent advisers in such matters as to the general scheme of organization appropriate for different classes of organizations under ideal conditions. When this is done it will be comparatively easy to make plans which, after the lapse of more or less time, can be so carried out as to bring the system of agricultural institutions in a given State into a comparatively harmonious whole.

It is believed that the discussion of these matters which has already taken place has greatly tended toward the establishment of general principles, however much on the surface it may have seemed thus far to have only produced greater confusion. For example, considerable advancement has been made toward establishing the functions of a college of agriculture as consisting of three main divisions—(1) research, (2) teaching, and (3) extension work. From this it naturally follows that the distinctive business of an agricultural experiment station is research, and that, even if for the time being the station is separated from the college, it is best that its functions should be restricted to that field.

Just now the discussion is very active as to the appropriate organization of extension work, because such work has hitherto been done more or less indiscriminately by colleges, experiment stations, and state departments of agriculture, and legislation on this subject is very complex and confusing. As one result of this discussion it is our belief that a clearer view of the administrative function of the state government as related to agriculture will emerge, and that thus it will be possible to establish strong state departments of agriculture, which will have organization and work distinctly differentiated from those of the colleges and stations, and that these departments will eventually take from the colleges and stations the inspection and other administrative business which has grown up in them because there has hitherto been no other good place for it.

We also believe that by thorough discussion it will appear that the conditions of administrative business are so diverse from those appropriate to educational and research institutions that the management of the colleges and stations should not be combined with that of the administrative departments of the state governments. The establishment of academic freedom and the peculiar liberty to devise and conduct satisfactory research along scientific lines are so fundamental to the highest success of our agricultural colleges and experiment stations that every effort should be made to secure these fundamental privileges. The rigid but necessary routine of administrative bureaus, once fastened on our institutions for higher education and research, would blight them at the heart. Elaborate equipment and

even well-trained personnel under such conditions would give only superficial and disappointing results.

One of the greatest obstacles to the working out of satisfactory plans for the differentiation of the work of our agricultural institutions lies in the misdirected ambitions of able men. The spirit of our times so strongly favors the formation of great combinations in the industrial and political world that scientific men once successful in their chosen line in too many cases become infected with the desire to become administrators of large and complex institutions.

The research man desires to be director of the station, and this accomplished, he longs to be dean or president of the college, or if this is denied to him, he feels that he must satisfy his administrative yearning by adding to his research work the routine business of an inspection laboratory or commission. The result is the building up of heterogeneous institutions in which research becomes incidental and the investigator is turned into a business man. How rare it is that first-class research work is turned out by a corps of assistants in charge of a man whose time is largely spent in teaching, faculty meetings, traveling on inspection tours, testifying in courts, etc.

There are, of course, men who, beginning in research work, find that their tastes and aptitudes lead them most strongly in the direction of administrative work. It is well that such men should not hold on to research work after their hearts are no longer fixed on it, but should give themselves to the important administrative duties for which they are best fitted. But this should not be allowed to interfere with the proper differentiation of functions in the organization of the institutions with which these men are connected.

To a larger extent than perhaps they think, the proper organization and management of our agricultural institutions lies in the hands of the scientific men connected with our agricultural colleges and experiment stations. If they can exemplify the advantages of differentiation of function in these institutions and the benefits of concentration of effort in well-defined lines, it will not be long before the world will recognize the proper way in which to organize agricultural education and research. When we have given due weight to the outside pressure often applied to determine the duties of men in our agricultural colleges and stations, it nevertheless remains true that the desire and fitness of the man himself will usually be the strongest factors in determining the purpose and outcome of his career.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Colloid chemistry. R. ZSIGMONDY (*Kolloidchemie. Leipsic, 1912. pp. XI+294. figs. 37*).—This textbook on colloid chemistry contains an introduction to the subject; a treatment of the properties of colloids, with theories; inorganic and organic colloids and their classification; general behavior of proteins and as special examples, gelatin, hemoglobin, and casein; and an appendix which deals with the chemical nature of some coloring matters.

The condition in which chlorophyll exists in the plant and in regard to colloidal chlorophyll, A. HERLITZKA (*Biochem. Ztschr., 38 (1912), No. 3–4, pp. 321–330; Ztschr. Chem. u. Indus. Kolloide, 11 (1912), No. 4, pp. 171–179; abs. in Chem. Zentbl., 1912, I, No. 13, p. 1032*).—A press juice, obtained from spinach by rubbing up the leaves with quartz sand and infusorial earth and pressing out with the Buchner press, contained chlorophyll in a colloidal state and in the same condition as the colloidal solution prepared by Willstätter. It therefore differed from that obtained by extraction with organic solvents. The press juice contained catalase, oxidase, and peroxidase.

The digestion of casein by pepsin obtained from a calf, pig, and adult bovine, W. VAN DAM (*Hoppe-Seyler's Ztschr. Physiol. Chem., 79 (1912), No. 4, pp. 247–273*).—Casein was digested with enzyms obtained from the stomach of a calf, pig, and adult bovine in solutions of hydrochloric acid, sodium hydrogen phosphate, and mixtures of hydrochloric acid or acetic acid with sodium acetate, and in a hydrogen ion concentration at which the casein was not soluble.

The rates of digestion and coagulation were found to run parallel. If the digestion of the casein was allowed to go on in a 0.3 normal hydrochloric acid solution the same differences for coagulation and digestion were noted as in Metts' experiment, so it is not necessary to assume the presence of another enzym to explain this phenomenon. It is probably dependent upon the differences in the systems which are compared and which are not alike with enzyms having different origins. Another fact militating against the hypothesis is that the products of acid digestion in strong or weak acid solutions seem to be identical.

On the starch of glutinous rice and its hydrolysis by diastase, Y. TANAKA (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 578–581*).—Although the starch of glutinous rice is characterized by a red coloration with iodin, it does not contain amylodextrin (Nageli's), erythrodextrin, and special albuminoids, which were considered by some investigators the cause of the red coloration. The microscopic characteristics of the starch granules and the hydrolyzed products do not appear to differ in any way from those of common rice starch.

According to the author the red coloration is probably due to the fact that this starch is only capable of dissolving a very small amount of iodin, and not due to the presence of other dextrins or proteins. Glutinous rice starch does not contain any starch which is colored blue by iodin, and is rapidly hydrolyzed

by diastase to dextrin with the production of less maltose than in the case of potato or common rice starch. The author considers that the glutinous rice starch contains a greater amount of amylopectin or some analogous constituent, which produces a dextrin hydrolyzed more slowly by diastase than the ordinary starch. He thinks it very probable that there are many other cereals in nature containing a similar variety of starch. Glutinous millet starch was found to behave like glutinous rice starch, and a similar starch has also been observed in "mochi-kibi" and a variety of "kaoliang."

In regard to diastase: Some further tests for the preparation of pure diastase and its properties, E. PRIBRAM (*Biochem. Ztschr., 44 (1912), No. 5–6, pp. 293–302, figs. 2*).—This is a continuation of the work begun by S. Fränkel and M. Hamburg[a] and deals with a modification of their method for preparing diastase.

The method as now proposed consists of mashing 5 gm. of finely ground barley malt with 20 liters of water by the same process as proposed by them, drawing it off quickly from the grains (draff) into a flask, and adding 500 gm. of pure pitching yeast and 500 gm. of calcium carbonate. The mixture is then allowed to ferment. The filtrate from the fermented mixture, which must not contain any reducing sugars, is concentrated in a vacuum apparatus until calcium lactate begins to be deposited, and allowed to cool until a heavy mass of crystals is obtained. The mass (fluid and crystals) is placed on a nutsche filter and the fluid removed by suction and pressure. The sirupy liquid obtained contains the diastase.

Using the preparation obtained in this manner, tests were made with a colloid filtration apparatus, which is illustrated. With the aid of this filter the size of the dispersoid particles can be approximately determined. It was found that the difference between the nature of the colloid filtrate and the preparation obtained by dialysis depends upon the amount of pressure used in the former method. The highly purified diastase was found to consist of two chief constituents, one containing from 7 to 8 per cent of nitrogen having a polypeptid character, which is composed of relatively few amino acids, and the other a carbohydrate-like substance, having strongly reducing properties, which is attached to a body having polypeptid characteristics. This is the first time this enzym or composite enzym has been prepared in a pure state.

Formation of invertase in yeasts, H. EULER and D. JOHANSSON (*Hoppe-Seyler's Ztschr. Physiol. Chem., 76 (1912), No. 5–6, pp. 388–395*).—A study of the variation in the invertase content of yeast. The inverting power was determined by the changes produced in the optical rotation of saccharose solutions containing chloroform. By cultivating yeast in sucrose or dextrose nutrient solutions, which contained in addition asparagin, magnesium sulphate, and potassium sulphate, an increase in inverting power was produced. The rate at which the inverting capacity increased was the same for dextrose and saccharose and trebled in the first 24 hours. It approached its maximum after about 3 days.

The regeneration of enzyms, A. A. RICHTER (*Izv. Imp. Akad. Nauk (Bul. Acad. Imp. Sci. St. Petersb.), 6. ser., 1911, No. 10, pp. 813–819; abs. in Chem. Zentbl., 1911, II, No. 7, p. 483*).—The ferments contained in yeast which was dead were regenerated. Common yeast (*Saccharomyces cerevisiæ*) was destroyed with antiseptics—toluol, phenol, chloroform—and the zymin extracted by Albert and Rapp's process. The zymin so obtained was capable of producing a fermentation.

[a] Beitr. Chem. Physiol. u. Path., 8 (1906), No. 8–10, pp. 389–398.

The hydrolytic action of glycin on ethyl butyrate, S. LIEBOWITZ (*Jour. Amer. Chem. Soc., 34 (1912), No. 8, pp. 1111–1113*).—The results show that there is a marked hydrolytic action due to glycin, and there appears to be a rough parallelism between the amount of activity and the quantity of glycin or of ethyl butyrate employed. Sodium chlorid when present had no effect upon the process.

In regard to the nature of humic acid, S. ODÉN (*Ark. Kemi, Min. och Geol., 4 (1912), No. 3, Art. 26, pp. 14*).—After reviewing the different theories in regard to the nature of humic acid, the objections to the present theory in regard to the action of alkalis upon humic acid, as a peptonization, and the known colloidal nature of alkali humates, are pointed out. The preparation of a colloid-free ammonium humate solution and of a salt-free suspension of the humic acid are then considered.

With the electrical conductivity method it was proved that the action of ammonia upon humic acid must be considered a true salt formation. The process of neutralizing humic acid with sodium hydrate was observed by the method, and the equivalent weight of humic acid was found to be approximately 339. The conductivity of sodium humate in dilute solutions pointed to the possibility that humic acid is tribasic in nature. The transformation of the alkali-insoluble modification of humic acid, produced by heating, into the usual form of humic acid by long exposure to ammonia, was also studied.

Refractometry, H. C. LYTHGOE (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 1 (1912), Sect. I, pp. 295–331*).—This is a review of the uses to which the various kinds of refractometers may be put in the examination of foods, condiments, beverages, drugs, and in pure chemistry. Several useful tables are appended for refractometric work, some of which show the value $\frac{N_2-1}{N_2+2}$ corresponding to scale readings of different refractometers.

Separation of calcium and magnesium, O. KALLAUNER and I. PRELLER (*Chem. Ztg., 36 (1912), Nos. 49, pp. 449–451; 50, pp. 462–464; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 10, p. 512*).—"The separation of calcium and magnesium by any of the modifications of the oxalate method is only satisfactory in dilute solutions in the presence of a considerable quantity of ammonium salts, after rapid filtration in the case of single precipitation, or after prolonged standing in the case of double precipitation. When a large amount of magnesium has to be separated from a small amount (up to 3 per cent) of calcium, the ordinary oxalate methods are unsatisfactory owing to the occlusion of magnesium oxalate. Single precipitation of calcium sulphate in alcoholic solutions does not yield accurate results; on the other hand Stolberg's method of dissolving the precipitated calcium sulphate in hydrochloric acid, and precipitating repeatedly as oxalate, is satisfactory. The authors recommend the following modification of Stolberg's method for the separation of calcium sulphate: The mixture containing calcium and magnesium (chlorids) is evaporated to dryness, moistened with water, and taken up with a saturated solution of lithium sulphate in a mixture of 10 per cent of ethyl and 90 per cent of methyl alcohol."

A method for the systematic qualitative detection of barium and strontium, L. J. CURTMAN and E. M. FRANKEL (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 1 (1912), Sect. I, p. 151*).—The usual systematic qualitative detection of barium is deemed distinctly unreliable. A scheme of analysis was therefore devised for this purpose which "consists in the precipitation of the alkaline earth metals, together with part of the lead, as sulphates with dilute sulphuric acid and alcohol, from a solution of definite acidity. After extracting the lead sulphate with ammonium acetate, the alka-

line earth sulphates are converted to carbonates by boiling with sodium carbonate solution. The carbonates are then dissolved in acetic acid and the resulting solution analyzed in the usual manner. Numerous test analyses proved the method to be trustworthy."

Modification of the Marsh method for the determination of arsenic. A. HEBERT (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *1* (*1912*), *Sect. I, pp. 213–215*).—The method is based on the same principle as that proposed by Van Bylert[a] for determining antimony and applying to the determination of arsenic. When some of the modifications proposed by A. Gautier and G. Bertrand for the Marsh method are introduced the method gives excellent results.

A new method of titration of arsenic acid, A. W. C. MENZIES and P. D. POTTER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *1* (*1912*), *Sect. I, pp. 367–371*).—When arsenic acid is titrated with sodium hydroxid it acts as a dibasic or monobasic acid according to whether the indicator employed is phenolphthalein or methyl orange. The latter is more sensitive towards the hydroxyl ion. In neither case is the end point sharp enough to detect more than 1 part in 300, and this can be done only with the help of a good light. Some preliminary experiments showed that the addition of barium chlorid to the arsenic acid before the titration gave a marked sharpening of the end point obtained with phenolphthalein.

The best procedure for the determination of arsenic was found to be the following: "A sufficiently large sample of arsenic acid should be used to require, as a dibasic acid, between 30 and 40 cc. of normal alkali. Fifteen cc. of saturated barium chlorid solution is added, the liquid diluted to 250 cc., boiled 15 minutes to remove carbon dioxid, cooled, and titrated with phenolphthalein as indicator. The alkali, which may profitably contain barium hydroxid to insure absence of soluble carbonate, is added with stirring until the locally formed precipitate becomes slow in redissolving. The walls of the vessel are now, if necessary, scratched below the surface of the clear solution until the liquid, on stirring, appears lustrous with fine crystals, after which the titration is completed. The lustrous crystals and final pink color make the titration resemble that of the Zimmermann-Reinhardt method for iron.

"The degree of concordance between duplicate determinations was well shown by the results of 19 analyses, each made in duplicate, the two members of which showed an average divergence from each other by one part in 1,500. Instead of basing the calculation of results upon the acidimetric factor of the alkali employed, it may perhaps be more convenient to determine the titer of the alkali against solutions containing known weights of arsenic acid. These may be prepared in any one of 3 ways: (1) By oxidizing known weights of pure arsenic trioxid by nitric acid, and evaporating off the excess of the reagent below 200; (2) by synthesis from the 3 to 5 hydrate, the preparation of which will be given in a future publication; (3) by synthesis from arsenic pentoxid."

The detection and estimation of exceedingly minute quantities of carbon dioxid, H. N. MCCOY and S. TASHIRO (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *1* (*1912*), *Sect. I, pp. 361–366, fig. 1*).—The method reported is meant for smaller quantities of carbon dioxid than can be detected by either the Pettenkoffer-Letts-Blake or the von Humboldt-Haldane methods. It can be employed for biological and other purposes.

On the behavior of iron salts, in the presence of albumins and other organic substances, towards certain reagents, H. J. M. CREIGHTON (*Proc. and*

[a] Ber. Deut. Chem. Gesell., 23 (1890), pp. 2968–2971.

Trans. Nova Scotian Inst. Sci., 13 (1911–12), No. 2, pp. 61–75).—"The results obtained in this investigation indicate that native and derived proteins prevent the ordinary reactions of substances containing trivalent iron, owing to the formation of associations between the protein and the iron salt. There is reason to believe that this phenomenon is partly physical and partly chemical—physical in that the colloid attracts the iron salts and forms adsorption compounds; and chemical in that the proteid actually combines with the iron salt. These physical and chemical complexes are readily broken down by hydrochloric acid. Complexes of soluble Prussian blue with gelatin are also decomposed in solution by hydrogen peroxid, but those with albumin are not. On the other hand, these complexes seem fairly stable toward heat, and in the case of those formed with soluble Prussian blue a temperature of 100° C. does not effect decomposition. Through the formation of complexes of proteins with soluble Prussian blue, the trivalent iron of the latter is probably reduced to the bivalent condition. No indication that complexes are formed by proteins and salts containing bivalent iron has been obtained. Neither cane sugar, glycerin, nor tartaric acid appear to form chemical or adsorption compounds with either ferro- or ferri-salts."

In regard to a colorimetric method for the quantitative determination of tryptophan and the tryptophan of keratin and other proteins, H. Fasal (*Biochem. Ztschr., 44 (1912), No. 5–6, pp. 392–401*).—The method utilized is based on the fact that tryptophan yields with glyoxylic acid and concentrated sulphuric acid the Adamkiewicz-Hopkins reaction, that is, an intense red-violet coloration is produced. The depth of the coloration varies with the tryptophan content. Tryptophan was determined in edestin, lactalbumin, and keratin from various sources.

Detection of rice and mineral matter in wheat flour, L. Surre (*Ann. Falsif., 4 (1911), No. 37, pp. 569, 570*).—This is a modification of Bellier's method, and consists of shaking the wash water thoroughly from the gluten determination, and then centrifuging 5 cc. for 2 minutes at a speed of 2,000 revolutions per minute. The supernatant layer is decanted and 5 cc. of Bellier's reagent, which consists of 85 parts of water, 5 parts of potassium hydroxid, and 15 parts of glycerol, is added to the residue. The residue is then stirred at a temperature of 30 to 40° C., until a translucent solution is obtained, when from 25 to 30 cc. of water is added, the mixture stirred again, and centrifuged for 5 minutes. After pouring off the supernatant fluid the rice grains and foreign mineral substances may be noted in the sediment with the aid of a microscope (300 diameters). The method can be so used as to give approximately quantitative results by comparing the findings with prepared standards of wheat and rice flour.

Detection of benzoic acid in foods, O. Biernath (*Veröffentl. Mil. Sanitätsw., 1912, No. 52, pp. 59–71; abs. in Ztschr. Angew. Chem., 25 (1912), No. 22, pp. 1133*).—The Jonescu reaction with 1 drop of a 1 per cent ferric chlorid solution and 3 or more drops of a 1 per cent hydrogen peroxid solution is a very sensitive test for benzoic acid and will detect as little as 1 mg. of this substance in foods by distillation within ¼ hour. Alcohol, inorganic acids, volatile fatty acids, and other volatile acids inhibit the reaction. The destruction of salicylic acid when benzoic acid is present can be accomplished by distilling the material with 20 cc. of water and 0.5 cc. sulphuric acid, and treating the distillate with an alkaline solution of potassium permanganate.

Occurrence of ferments in the sterile milk collected by milking tube from cows and goats, A. Harden and Janet E. Lane-Claypon (*Jour. Hyg. [Cambridge], 12 (1912), No. 2, pp. 144–151*).—Peroxidase and catalase were shown to be present in goat's and cow's milk. The catalase content was highest in goat's milk. For making the catalase determination the Harden, Thompson, and Young apparatus was used. "The reduction of methylene blue does not

occur with catheter milk of either goats or cows, at any rate within many hours. Schardinger's reagent is not reduced by goats' milk, but catheter milk from a cow frequently reduces it."

In regard to clarifying the views about the reducing properties of cow's milk, R. BURRI and J. KÜRSTEINER (*Milchw. Zentbl., 41 (1912), Nos. 2, pp. 40–44; 3, pp. 68–74; 4, pp. 101–105; 5, pp. 134–140; 6, pp. 168–172*).—A normal raw milk contains reductase which is not of bacterial origin, but it may have some relation to the cellular elements (leucocytes and epithelial cells) present. Probably no milk exists which does not reduce methylene blue. It was also found that milk which is heated gradually up to the boiling point over a long period of time will show an increase in reducing properties. Sterilized milk kept for various lengths of time lost in reducing power, but much seemed to depend on whether the sample was preserved and taken from a vessel lying sidewise or standing upright. Tests conducted under anaerobic conditions brought out the fact that the results so obtained are usually too high and require a correction for the error introduced by insufficient exclusion of oxygen. The quality of the methylene blue employed in the tests may also be a source of error. The reaction can be best conducted at 70° C., it having been found that from 40 to 50° is an unreliable temperature. In all probability the Schardinger reaction is produced by an enzym.

The rapid determination of fat in milk by the "neu-sal" method, C. HUYGE (*Rev. Gén. Lait, 9 (1912), No. 8, pp. 181–187*).—The "neu-sal" method is deemed satisfactory for the determination of fat in fresh or preserved milk, except that it can not be used where milk is preserved with formaldehyde. For milk which is very acid or for skim milk and buttermilk the results obtained are low.

Method for determining fat in sugared evaporated milk, F. C. BROEMAN (*Jour. Indus and Engin. Chem., 4 (1912), No. 9, p. 672*).—The method is conducted as follows: Ten gm. of the milk is mixed with 100 cc. of hot water, 5 cc. copper sulphate solution (blue Fehling's solution) added, and the mixture stirred. The precipitate contains the fat which is filtered off at once and washed with hot water, and the precipitate transferred to a 150 cc. beaker. After a little experience it can be removed without leaving a particle sticking to the paper. Ten cc. of concentrated hydrochloric acid is added, the solution heated on a hot plate until the solution turns a chocolate brown, cooled, from 2 to 3 times its volume of alcohol added, and extracted 4 times with petroleum ether in a separatory funnel. "The results obtained agree with those obtained by the extraction methods when carried out under the most exacting conditions. The determination can be completed entirely in 1 hour."

Estimation of nicotin in tobacco, E. F. HARRISON and P. A. W. SELF (*Pharm. Jour. [London], 4. ser., 34 (1912), No. 2537, pp. 718, 719; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, pp. 704, 705*).—The proposed method is based on the separation of ammonia from nicotin by precipitating the latter with iodin.

The Outerbridge test for mineral and rosin oils, L. W. SARGENT (*North Dakota Sta. Rpt. 1911, pt. 2, pp. 149, 150*).—Using the Outerbridge test (E. S. R., 26, p. 114), menhaden fish oil, corn oil, Chinese wood oil, linseed oil, soy-bean oil, boiled linseed oil, and rosin oil were examined.

"In the case of colored oils the differences of fluorescent intensity were found to be increased by dilution with nonfluorescent chloroform; but even with this help the test was, in most cases, highly insensitive. For instance, an addition of 10 per cent of highly fluorescent kerosene to linseed oil failed to show any difference in intensity. An addition of 25 per cent of kerosene showed a barely distinguishable increase in intensity over that of the pure oil.

"The fact that strongly fluorescent kerosene can be debloomed by a small addition of nitrobenzol, shows the inefficiency of the test for one kind of debloomed oil at least. However, in deblooming rosin oil with nitrobenzol, there is a tendency to leave a 'red edge' fluorescence, which, together with the tendency for this oil to fluoresce blue instead of green, as does mineral oil, when in admixture with yellow oils, suggests a possible use of the test in distinguishing between mineral oil and rosin oil, and perhaps by using the spectroscope, the pure vegetable oils."

The bromin and iodometric methods for the volumetric determination of cresol, C. M. PENCE (*Jour. Indus. and Engin. Chem., 4 (1912), No. 7, pp. 518–520*).—In this work it is pointed out that tribrom ortho- and para-cresol brom compounds are not formed in a manner analogous to the formation of 2, 4, 6 in tribrom phenol brom. Dibromcresol compounds are produced and finally tribrom phenol brom. Notwithstanding this ortho- and para-compounds can not be determined volumetrically by conversion into these compounds.

"Meta cresol is determined by a conversion into tribrom-m-cresol. Ortho and para cresols form diïodo compounds, and this reaction is made the basis of a method for their determination. Meta cresol does not yield diïodo compounds under the same conditions; hence, cresol United States Pharmacopœia or any mixture containing m-cresol can not be determined by a volumetric iodin method."

Some recent work in sugar chemistry, W. E. CROSS (*La. Planter, 49 (1912), No. 14, p. 225*).—A brief résumé of some recent work in regard to the refractometer and polariscope as applied to sugar analysis, with an account of some of the happenings at the meeting of the International Commission for the Unification of Sugar Methods, held in New York.

Theoretical and practical treatise of the manufacture of sugar from the beet, P. HORSIN-DÉON (*Traité Théorique et Pratique de la Fabrication du Sucre de Betterave. Paris, 1911, 3. ed., vols. 1, pp. XV+650; 2, pp. 651–1292, pls. 5, figs. 280*).—This is the third enlarged and revised edition of this well-known work on the chemistry and technology of beet-sugar manufacture. The cultivation of the sugar beet is also considered.

Hot and cold extraction of sugar from the beet, R. CHAPELLE (*Bul. Assoc. Chim. Sucr. et Distill., 29 (1912), No. 7, pp. 452–462*).—The methods which extract sugar from the beet in the cold with water or those employing alcohol at 80° C. do not extract the sugar completely. Only digestions at a temperature around 100° will give correct figures.

Analysis of the beet, M. H. PELLET (*Sucr. Indig. et Colon., 80 (1912), Nos. 3, pp. 51 59; 4, pp. 81–88*).—This is a polemic in regard to the temperatures most suitable for use in extractions for determining the sugar content. The author maintains that Chapelle has not taken into consideration the solution of the pectin bodies at higher temperatures, and furthermore that these substances are optically active. The technical aspects of the problem are also discussed. Some of the results of tests which are included show that the extraction in the cold will yield practically the same figures obtained by hot extractions if properly conducted.

The preparation of betain hydrochlorid from molasses refuse, F. EHRLICH (*Ber. Deut. Chem. Gesell., 45 (1912), No. 12, pp. 2409–2413*).—After stating that the process for preparing betain recently patented by Stoltzenberg[a] is practically the same, with a few minor modifications, as that patented 8 years ago by the author, the method and its advantges (E. S. R., 26, p. 612) are again described in detail.

[a] Ber. Deut. Chem. Gesell., 45 (1912), No. 11, pp. 2248–2252.

Report of the agricultural experiment stations of Austria-Hungary (*Ztschr. Landw. Versuchw. Österr., 15 (1912), No. 5, pp. 585–641*).—These are the reports in regard to the activities of the following institutions for the year 1911: Agricultural-Chemical Experiment Station and Food Laboratory at Breganz, in Vorarlberg, by J. M. Krasser (pp. 585–597); the Agricultural-Chemical Experiment Station at Dublany (pp. 598–601); Agricultural-Chemical Experiment Station and Seed Control Station at Graz, by E. Hotter (pp. 602–613); Agricultural and Food Laboratories of the Duchy of Klagenfurt, at Carinthia, by H. Svoboda (pp. 614–626); Chemical-Physiological Experiment Station of the Royal Bohemian Technical High School at Prague (pp. 627–630); Experiment Station for the Sugar Industry at Prague, by K. Preis (pp. 631–634); and the Agricultural-Botanical Experiment Station of the Royal Bohemian Agricultural Academy at Tabor (1909, 1910, and 1911), (pp. 635–641).

METEOROLOGY—WATER.

The rise of agricultural meteorology (*Sci. Amer., 108 (1913), No. 5, p. 112*).—Attention is called to the recent appointment of an international commission on agricultural meteorology as indicating an awakening of interest in this subject. Advances made along this line of investigation under the direction of Brounov in Russia are briefly referred to.

The relation of weather to agriculture, W. N. Shaw (*Abs. in Jour. Bd. Agr. [London], 19 (1912), No. 5, pp. 366, 367; Quart. Jour. Roy. Met. Soc. [London], 38 (1912), No. 164, p. 274*).—This is a brief note on a paper read at a conference of agricultural teachers at Cambridge, in which the author attempted to show the large crop losses due to unfavorable weather conditions which could in part at least be prevented by the intelligent use of forecasts. The connection between crop production and such meteorological factors as temperature, sunshine, and rainfall was illustrated, especially the intimate connection between the weather prevailing (rainfall) in one autumn and the yield of wheat the following year. "It appears that the yield of wheat depends to a great extent on the amount of the previous autumn's rainfall. Further, there appears to be a cycle of 11 years with regard to average wheat yield."

The progress of Mount Rose Observatory, 1906–1912, J. E. Church, Jr. (*Science, n. ser., 36 (1912), No. 936, pp. 796–800*).—The progress of observations, mainly on the relation of topography to frost and the influence of mountains and forests upon the conservation of snow, carried on by the Nevada Station, is briefly reviewed. See also previous notes (E. S. R., 27, pp. 240, 617).

The conservation of snow: Its dependence on mountains and forests. J. E. Church, Jr. (*Off. Bul. Internat. Irrig. Cong., 1 (1912), No. 6, pp. 45–47, 50–52*).—Observations in the Sierra Nevada, mainly on Mount Rose, are cited to show that "the conservation of snow is dependent upon mountains and forests, and is most complete where these two factors are combined." How conservation may be promoted by judicious forest planting and management is pointed out.

Climates of the earth, A. Hettner (*Geogr. Ztschr., 17 (1911), Nos. 8, pp. 425–435, figs. 6; 9, pp. 482–502; 10, pp. 545–565, fig. 1; 11, pp. 618–633; 12, pp. 675–685*).—This series of articles gives a general résumé of climatology. It discusses separately the different climatic factors, such as solar radiation; atmospheric circulation; humidity, cloudiness, and rainfall; light and color of the sky; temperature; influence of continents and seas, etc.; and describes concisely the characteristics of the principal climatic zones of the earth.

Climate [of Porto Rico], M. D. Carrel (*Register of Porto Rico, 1911, pp. 8–30, pls. 3*).—This account, based on U. S. Weather Bureau observations, de-

scribes the general characteristics of the climate of Porto Rico, reviews in detail temperature and rainfall conditions, and briefly discusses humidity, sunshine, cloudiness, winds, and storms.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 9, pp. 1293–1456, pls. 10, figs. 2; 10, pp. 1457–1610, pls. 9*).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for September and October, 1912, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 9.—The Tropical Storm of September 13–14, 1912, by A. Ashenberger; Tornado Near Syracuse, N. Y., by M. R. Sanford; Seiches in Lower Lake Michigan in May, 1912, by W. R. Bormann (illus.); Wisconsin River Flood, September, 1912, by J. H. Spencer; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during September, 1912, by N. R. Taylor; Notes on Streams and Weather of the Upper San Joaquin Watershed, by W. E. Bonnett; Excessive Rains in California, by A. G. McAdie; Minimum Temperature on Mount Whitney, Cal., by A. G. McAdie; Bear Valley Hydroelectric Development, California, by J. H. Wise; The Spaulding Dam of the Bear Valley Hydroelectric Development, California (illus.), by H. Schussler; Samuel L. Brooks (obituary); and Importance of Meteorological Data in Engineering, by G. S. Bliss.

No. 10.—Winter Weather in Florida, by A. J. Mitchell; Water Power Projects on the Escanaba River, by V. E. Jakl; Using Weather Data in Engineering Problems, by A. H. Thiessen; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds during the Month of October, 1912, by N. R. Taylor; Notes on Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Frost Studies, by A. G. McAdie; Apples, Codling Moth, and Climate, by C. W. Woodworth; and Note on Climatological Averages.

Climatic data, C. C. Georgeson (*Alaska Stas. Rpt. 1911, pp. 76–84*).—This is a summary in the usual form of observations on temperature, precipitation, and weather conditions at the different Weather Bureau stations in Alaska.

Climatic conditions, M. D. Snodgrass (*Alaska Stas. Rpt. 1911, pp. 55–59*).—Observations on temperature and precipitation for each month, and notes on weather and crop conditions at Kodiak during the year ended September 30, 1912, are recorded.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. W. Angier (*Massachusetts Sta. Met. Buls. 287, 288, pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1912, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.7, March 6; minimum, 28.72, February 22; mean, 30.007. *Air temperature*, in ground shelter (degrees F.).—Maximum, 98.5, July 8 and 9; minimum, —19, January 14; mean hourly, 46.5. *Humidity.*—Mean dew-point, 38.6; mean relative humidity, 77.3. *Precipitation.*—Total rainfall or melted snow, 38.56 in.; number of days on which 0.01 in. or more rain or melted snow fell, 117; total snowfall, 33.8 in. *Weather.*—Total cloudiness recorded by sun thermometer, 2,076 hours, or 46 per cent; number of clear days, 71. *Bright sunshine.*—Number of hours recorded, 2,390, or 54 per cent. *Wind.*—Prevailing direction, west; total movement, 55,897 miles; maximum daily movement, 578 miles, February 22;

minimum daily movement, 3 miles, February 17; maximum pressure per square foot, 23 lbs., February 22, west-southwest. *Dates of frost.*—Last, May 1; first, August 31. *Dates of snow.*—Last, April 9; first, November 5.

Meteorological observations, D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich., 51 (1912), pp. 113–130*).—Tabulated daily and monthly summaries are given of observations during the 18 months ended June 30, 1912, at East Lansing, Mich., on temperature, pressure, precipitation, cloudiness, wind movement, etc.

Meteorological tables, C. FLAMMARION (*Ann. Astron. et Mét. [Paris], 49 (1913), pp. 224–241*).—These tables summarize observations for long periods in Paris and its environs on temperature and rainfall.

Secular increase in rainfall at Paris, C. FLAMMARION (*Ann. Astron. et Mét. [Paris], 49 (1913), pp. 242–246, figs. 5*).—An irregular and gradual increase from 1804 to 1910 is shown.

Results of rainfall observations made in Victoria during 1840–1910, H. A. HUNT ET AL. (*Melbourne, Aust., Commonwealth Bureau of Meteorology, [1912], pp. XXXVIII+55, pls. 12, fig. 1*).—This volume gives a concise history of the rainfall of Victoria since records have been taken, up to the end of 1910, and includes tabulations of all available records of total rainfall and the number of rainy days for 1,114 stations. It also includes a compilation of annual rainfall maps as well as an authentic average rainfall map, a diagram showing the annual variation of rainfall from the mean, and a map giving the average rainfall for the wheat-growing period.

Water for agricultural and technical purposes, CLUSS ET AL. (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 11, pp. 1221–1231*).—This article discusses the qualities of water required for household and farm use, for steam boilers, and in baking, dairying, starch and sugar making, malt making, brewing, distilling, yeast making, tanning, glue and gelatin manufacture, and silk spinning. A bibliography of the subject is given.

The decomposition of water by solar rays, M. KERNBAUM (*Bul. Internat. Acad. Sci. Cracovie, Cl. Sci. Math. et Nat., Ser. A, 1911, No. 10A, pp. 583–586, fig. 1; abs. in Met. Ztschr., 29 (1912), No. 9, pp. 442, 443*).—Small amounts of hydrogen and hydrogen peroxid were found in water which had been subjected to the sun's rays for several days in July, thus indicating a reaction similar to that which occurs when water is subjected to the action of ultraviolet rays.

Sterilization of water by means of ultraviolet rays, A. MÜLLER (*Arb. K. Gsndhtsamt., 43 (1912), No. 3, pp. 475–482*).—Experiments are reported which led to the conclusion that complete sterilization can be secured by the mercury-vapor lamp sterilizers only with very slow currents of clear water containing comparatively small numbers of germs.

The sterilization of drinking water by ultraviolet radiations, J. COURMONT (*Ann. Rpt. Smithsn. Inst., 1911, pp. 235–245, figs. 3*).—This has already been noted from other sources (E. S. R., 27, p. 317).

SOILS—FERTILIZERS.

Chemistry, physics, and biology of the soil, M. HOFFMANN (*Jahresber. Landw., 26 (1911), pp. 21–65*).—Recent investigations on this subject are classified and reviewed.

Scope and methods of bacteriological soil investigations, F. LÖHNIS (*Landw. Jahrb., 42 (1912), No. 5, pp. 751–765*).—The author attempts to define the field and classify the methods of bacteriological investigations of soils.

[Abstracts of some papers published in Egypt dealing with soils and waters], H. E. HURST (*Agr. Jour. Egypt, 2 (1912), No. 1, pp. 14–26*).—This is

an annotated list of 43 papers on Egyptian soils and surface and underground waters.

Work of the chemical laboratory of the Ploti Experiment Station, 1911, A. Bychikhin and S. Skalski (*Godichnyĭ Otchet Ploti. Selsk. Khoz. Opytn. Stantsii, 17 (1911), pp. 175–244, 259–275, pls. 4, figs. 3*).—The work of this laboratory was extended during the year to include bacteriological as well as chemical studies of the soil. The transformation of the easily soluble phosphoric acid of the soil into insoluble forms under the influence of biological and chemical factors, and the intensity of the process of nitrification in fallow soils, were studied both in the laboratory and by means of pot experiments.

Soils sterilized by chloroform (action of 50 cc. of chloroform on 1 kg. of soil for 3 days) or heat (for 1 hour at 2½ atmospheres) showed more easily soluble (in dilute acetic acid) phosphoric acid than unsterilized soils. The addition of potassium nitrate increased the biological assimilation of the easily soluble phosphoric acid of the soil. The conversion of water-soluble into insoluble phosphoric acid was more rapid in fallow soils than in those not under fallow and in the tilled layer of the soil than in the subsoil. It was also most rapid where the phosphoric acid was least abundant, especially in case of the subsoil.

Nitrification as well as loss of nitrates by leaching was more rapid (2 and 2½ times respectively) in autumn fallow soils than in summer fallow. The nitrates were also distributed to a greater depth. The conditions as regards nitrates in spring fallow more nearly approached those of autumn fallow than of summer fallow.

The chemistry of steam-heated soils, O. Schreiner and E. C. Lathrop (*U. S. Dept. Agr., Bur. Soils Bul. 89, pp. 37, figs. 3*).—The authors review investigations by others on the effect of partial sterilization on the biological activities of soils, and report a study of the changes produced in soil organic matter in the process of sterilization by heat, and of the effect of the different organic constituents on plant growth.

Samples of two soil types, the Elkton silt loam and the Sassafras silt loam, were used. Both soils contained practically the same quantity of organic matter, the Elkton 2.25 per cent and the Sassafras 2.24 per cent. The former contained 0.13 per cent of carbonates and the latter only 0.03 per cent. Both were acid to litmus paper, the Sassafras being slightly the more acid of the two. The soils had received the same general field treatment and the same kind of organic matter in the form of manure and crop débris. In the experiment the soils were heated in stoneware jars placed in a copper autoclave at 30 lbs. pressure for 3 hours at a temperature of 135° C. Generally from 40 to 50 lbs. of soil was digested for 7 hours with 20 gal. of 2 per cent sodium hydroxid solution, and the soil solution so obtained was acidulated and filtered. The acid filtrate, after neutralization and concentration, was used in the isolation and identification of the various organic constituents, by methods which have been described in detail in previous bulletins of the Bureau (E. S. R., 25, p. 118) and are here only briefly described.

Guanin was isolated for the first time as a constituent of soil organic matter.

It was found that, in accordance with the work of other investigators, heating produced "an increase in water-soluble constituents and an increase in acidity. At the same time ammonia and amins were formed.

"By the process of heating there was an increase in all of the constituents isolated from the unheated soil except nucleic acid." xanthin, hypoxanthin, guanin, cytosin, and arginin being formed when not previously existing. "These compounds are decomposition products of nucleic acid and protein material, and are all beneficial to plant growth. . . .

"Dihydroxystearic acid was increased when present, and produced, when not previously present, by the heating process. This compound is harmful to plant growth [E. S. R., 24, p. 32].

"Both beneficial and harmful compounds were produced by heating the soils and were isolated. This bears out the experience of previous investigators with cultural tests.

"Cultural tests in these soils and their extracts showed that the heated soils gave a poorer plant growth.

"Although the majority of compounds formed must be classed as beneficial, the harmful compound formed at the same time more than overbalances their effects. Not until this harmful compound is eliminated or diminished can the full beneficial effects of heating be demonstrated.

"In soils there is a balance of beneficial and harmful factors, soil fertility or infertility being the resultant of the two groups. As one or the other group of factors gains the ascendency, the fertility is raised or lowered, as the case may be. This balance is influenced by cultural treatment, fertilizers, liming, crop growth, or crop rotation, etc., as well as by steaming."

The following table shows the relation between the organic constituents of the unheated and those of the heated soils as determined in the experiments:

Organic compounds isolated from heated and unheated soils.

Elkton silt loam.		Sassafras silt loam.	
Unheated.	Heated.	Unheated.	Heated.
Nucleic acid	Nucleic acid	Nucleic acid	Nucleic acid.
Xanthin	Xanthin		Xanthin.
	Hypoxanthin	Hypoxanthin	Hypoxanthin.
Adenin	Adenin		
			Guanin.
	Cytosin		Cytosin.
Pentose sugar	Pentose sugar	Pentose sugar	Pentose sugar.
Pentosans	Pentosans	Pentosans	Pentosans.
Histidin	Histidin	Histidin	Histidin.
			Arginin.
Creatinin	Creatinin	Creatinin	Creatinin.
Dihydroxystearic acid	Dihydroxystearic acid		Dihydroxystearic acid.
	Unidentified aldehyde		Unidentified aldehyde.

The chemistry of steam-heated soils, O. SCHREINER and E. C. LATHROP (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1242–1259, figs. 2*).—This is a short account of the investigations noted above.

Some organic soil constituents, E. C. SHOREY (*U. S. Dept. Agr., Bur. Soils Bul. 88, pp. 41, pl. 1*).—In continuation of previous work (E. S. R., 26, p. 419) the author isolated and studied oxalic acid, succinic acid, saccharic acid, acrylic acid, lysin, adenin, cholin, trimethylamin, salicylic aldehyde, an unidentified aldehyde, mannite, rhamnose, sulphur, trithiobenzaldehyde, and nucleic acid from the organic matter of soils. "These together with those isolated before and described in previous bulletins make 35 organic compounds isolated from soils," which may be classified as follows: 13 organic acids, 9 organic basic compounds, 3 carbohydrates, 2 aldehydes, 2 alcohols, 1 each hydrocarbon, glycerid, ester, sulphur compound, phosphorus compound, and an acid hydrid."

The methods of isolation of the different substances are described, and the general methods used in the study of the organic compounds of the soil and the desirability of simplification or unification of these methods are discussed.

Occurrence and nature of carbonized material in soils, O. SCHREINER and B. E. BROWN (*U. S. Dept. Agr., Bur. Soils Bul. 90, pp. 28, pls. 7*).—Studies were

made of the nature and distribution of the organic materials of the soil insoluble in water, alkali, and other ordinary solvents. Samples of surface soil and subsoil (to 50 ft. below the surface in some cases) of a number of different soil types from various parts of the United States from cultivated fields and virgin forest lands were used.

"Several distinct types of organic particles were obtained, among which may be enumerated (1) plant material of organic structure, (2) insect and other material of organized structure, (3) charcoal particles, (4) lignite particles, (5) coal particles, and (6) other material, some of which suggests intermediate stages of formation. . . .

"The presence of the black charcoal-like and coal-like particles was shown in all the soils examined. . . . The black particles were also encountered in ordinary subsoils as well as in samples collected at depths of 15 to 50 ft. below the surface. . . .

"The frequency of occurrence and the nature and appearance of the various particles are suggestive of their formation in the soil, inasmuch as genetic relationship between many of the particles appeared to exist. The recognition of such material in soil as well as the various changes which these have undergone gives a better insight into the soil organic matter as a whole and makes clear the nature of a not inconsiderable portion of soil organic matter which is apparently very resistant to further change."

The methods used in separating and classifying the organic particles are described in detail.

A preliminary report on a field study of soil moisture, A. G. McCall and H. J. Bower (*Proc. Amer. Soc. Agron., 3 (1911), pp. 72–76, pls. 2*).—The author describes a method of enclosing blocks of soil in the field for purposes of studying the behavior of soil moisture. Reference is also made to preliminary determinations at the Nebraska Station of the moisture and nitrate contents in samples of such soil blocks planted to corn. The blocks were 3½ ft. square and 4 and 6 ft. in depth.

"The isolation of these blocks of soils was accomplished by digging a deep trench on two sides and tunneling under at the proper depth. The blocks were allowed to remain in contact with the adjacent soil on two sides until a heavy plate of galvanized iron had been inserted under the soil and securely supported by means of a cement concrete pier. The blocks were then cut free and a case of heavy galvanized iron slipped down over the block until it rested on the galvanized iron plate at the bottom. The watertight joint between the casing and the bottom was secured by a crimped and soldered joint. By this means blocks of soil were securely cut off from all contact with the surrounding soil. Before the trenches were filled a stand pipe was erected on the outside, but connected with the interior near the bottom, the opening into the tank being protected by means of a fine wire screen."

An open tank equipped with a siphon arrangement for maintaining the water table was sunk into the soil near the soil tanks. By this means comparison was made between the evaporation from the free water surface and the surface of the soil. Rainfall was excluded by means of tight frames covered with tarred paper. "These frames were built in two sections, which when brought together formed an A-shaped covering, with an opening at the apex for the accommodation of the corn plant. The covers were made practically watertight at this point by means of a strip of oilcloth which was wrapped around the corn plants after the frames were placed in position. The point of contact between the plants and the oilcloth was made waterproof by the use of vaseline."

During the season monthly determinations were made of moisture and nitrate contents for each foot of soil. No definite results were obtained as the corn

plants failed to mature owing to the tight cover used to exclude the rain. These covers have, therefore, been discarded and tents substituted for the future experiments.

The effect of soil moisture and temperature on the availability of plant nutrients in the soil, J. O. MORGAN (*Proc. Amer. Soc. Agron., 3 (1911), pp. 191–249, figs. 18*).—Investigations on the subject by others are briefly reviewed, and the results of pot and wire basket experiments to determine the effect of different percentages of soil moisture on the action of fertilizers and the relation of the moisture content and various fertilizer mixtures and materials to the general development and chemical composition of the plant, are reported in detail, using oats as the crop. The water content varied between 17.6 and 42.8 per cent.

It was found that an increase in soil moisture increased the length of time from planting to heading 2 days in case of oats and 3 days in case of wheat; decreased the stooling of the oats and increased the stooling of wheat; greatly increased the production of dry matter; greatly reduced the percentage increase in yield due to fertilizers; decreased root growth; and increased the total nitrogen of the crop.

"The percentage increase in yield due to potassic and phosphatic fertilizers has decreased more rapidly following an increase in soil moisture than has that due to nitrogenous fertilizers.

"An increase in soil moisture has greatly decreased the percentage of dry matter in plants.

"The amount of dry matter produced per gram of transpiration is greater in a medium than in a low or high moisture soil. . . .

"The percentage of nitrogen in crop decreases as the yield of crop increases and vice versa, unless the increased yield is the result of abundant nitrogen in a low moisture soil. . . .

"A complete fertilizer added to soils of both low and high moisture content has been most effective when applied either at the time the plants possessed five well-developed leaves or later when they showed evidence of heading."

Water as a factor of plant growth, E. A. MITSCHERLICH (*Landw. Jahrb., 42 (1912), No. 5, pp. 701–717, figs. 6; abs. in Chem. Zentbl., 1912, II, No. 15, p. 1805*).—The author concludes from experiments with oats, peas, and mustard that the yield increased with the water supply in accordance with the law of minimum and regardless of the kind of plant, the climate, or the physical properties or volume of the soil.

The law of minimum, I. POUGET and D. CHOUCHAK (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 4, pp. 303–306, figs. 2; abs. in Chem. Zentbl., 1912, II, No. 15, pp. 1304, 1305*).—Referring to a previous communication by Mazé (E. S. R., 27, p. 721), the authors attempt to show that the law of minimum and the so-called law of physiological ratios proposed by Mazé are not necessarily contradictory, but that the law of minimum is of importance in plant growth only when an element of plant food remains insufficient throughout the period of the experiment.

The law of minimum, E. A. MITSCHERLICH and O. FRÖHLICH (*Landw. Jahrb., 42 (1912), No. 3, pp. 423–428*).—Brief notes are given on certain controverted points with regard to this subject.

The determination of hygroscopicity as a means of judging soils, R. FLOESS (*Landw. Jahrb., 42 (1912), No. 2, pp. 255–289, pls. 5; abs. in Ztschr. Angew. Chem., 25 (1912), No. 40, p. 2085; Chem. Zentbl., 1912, II, No. 5, p. 378*).—The inaccuracy of mechanical analysis increases with the humus content of the soil and accurate sampling of the soil for the purpose is a difficult and tedious process. Mechanical analysis is therefore deemed unsuitable for

judging soils. On the other hand the yield was found to increase with the hygroscopicity, and it is therefore concluded that the latter furnishes a good means of judging soils.

On the thermal diffusivity and the water content of the soil, Y. Tsuiji (*Jour. Met. Soc. Japan, 31 (1912), No. 1, pp. 13*).—Supplementing mathematical studies by S. Fujiwara, T. Miyazawa, and T. Okada on diffusion of heat in snow (E. S. R., 23, p. 15), the author shows that the water content of the soil at different depths is an important factor in determining the diffusion of heat in the soil. Data on the subject are, however, limited.

Movement of salts in semiarid soils, G. I. Kolotov (*Abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, pp. 832–833*).—Examinations of the salt contents in soil solutions from places where cereals made poor growth led to the conclusion that in drought the alkali salts rise by capillarity and are deposited at the surface. The limited rainfall carries down into the soil only the easily soluble salts like sodium chlorid, and the less soluble salts of lime remain in the upper layer of the soil. The salts carried deep down can not soon rise again, hence the accumulation chiefly of the less soluble salts of lime in the upper layers of the soil. Irrigation and the topography of the ground also modify the movement and distribution of the salts.

Nonfixation of phosphoric acid by an acid forest soil, A. Petit (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 19, pp. 921–923; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 20, p. 636*).—The author found that a forest soil, although very rich in humus, was not only incapable of absorbing phosphoric acid from a solution of monocalcium phosphate, but, on the contrary, yielded a more or less constant proportion of its phosphoric acid to the solution.

Rôle of forests in soil formation, M. Tkachenko (*Izv. Imp. Lĕsn. Inst. (Mitt. K. Forstinst. St. Petersb.), 18 (1908), pp. 85–198, pls. 19; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, pp. 837–839*).—Observations on chernozem soils under cereals and under plantations of oak, fir, and larch trees planted at intervals from 1863 to 1875 showed marked chemical and physical changes in the soil as a result of the tree growth.

Some remarks regarding E. Blanck's work on the chemical and physical nature of red soils, D. J. Hissink (*Jour. Landw., 60 (1912), No. 3, pp. 237–241; abs. in Chem. Zentbl., 1912, II, No. 15, p. 1305; Chem. Abs., 6 (1912), No. 22, p. 3305; Jour. Chem. Soc. [London], 102 (1912), No. 600, II, p. 981*).—The author points out that the analyses of soils reported by Blanck (E. S. R., 27, p. 513) showed a much more distinct relation between the hygroscopicity and the silicate complex decomposable in hydrochloric acid than between the hygroscopicity and the ferric oxid and soluble alumina of the soil.

Comments on Hissink's criticisms of the author's work on the chemical and physical properties of red soils, E. Blanck (*Jour. Landw., 60 (1912), No. 4, pp. 397–400*).—A reply to the above.

The development of soil survey work in the United States with a brief reference to foreign countries, G. N. Coffey (*Proc. Amer. Soc. Agron., 3 (1911), pp. 115–129*).—The subject is discussed on the basis of the work of the Bureau of Soils of this Department, a brief reference being also made to reports of similar work in other countries, particularly in Russia.

Sangamon County soils, C. G. Hopkins et al. (*Illinois Sta. Soil. Rpt. 4, pp. 40, pls. 3, figs. 4*).—This is the fourth of a series of Illinois county soil reports and gives the results of a soil survey, including map, of Sangamon County. The soil formation and types of the regions are described, and estimates from chemical analyses of the plant-food content per acre of the soil are given, together with the results of fertilizer tests on soils of the county and on similar

types in other counties. An appendix discusses the methods of the state soil survey and crop and fertilizer rotations for permanent soil improvement.

The area is representative of the corn belt section of the State, being located almost wholly within the middle Illinois glaciation. The three main soil groups are the upland prairie soils, the upland timber soils, and the bottom land, comprising approximately 71 per cent, 20.61 per cent, and 8.93 per cent, respectively, of the entire area of the county.

The brown silt loam of the upland prairie soils is the most extensive type of soil, covering 53.87 per cent of the entire area.

Surface geology and agricultural conditions of the southern peninsula of Michigan, F. LEVERETT and C. F. SCHNEIDER (*Mich. Geol. and Biol. Survey Pub. 9, Geol. Ser. 7, 1912, pp. 144, pls. 15, figs. 16*).—The work here reported, which was done in cooperation with the U. S. Geological Survey, included studies of the glacial and lake features and agricultural conditions of the southern peninsula of Michigan. A chapter on the climate of the region by C. F. Schneider is also given.

The several classes of land, which are described and mapped, are as follows: Swamp and lake, 11.6 per cent; clayey till, 32.65 per cent; sandy till, 22.55 per cent; sandy, 25 per cent; and gravelly, 8.2 per cent. Only a small part of the soil of the southern peninsula is influenced by the underlying rocks. The agricultural value of the lands is discussed.

The physiography and geology of the Coastal Plain province of Virginia, W. B. CLARK and B. LEE. MILLER (*Va. Geol. Survey Bul. 4, 1912, pp. 274, pls. 19*).—This report also contains articles on The Lower Cretaceous, by E. W. Berry, and The Economic Geology, by T. L. Watson. The sections of special agricultural interest are those relating to soils and to the greensand and calcareous marls which occur in abundance in the region.

The peat and muck deposits of Vermont, J. L. HILLS and F. M. HOLLISTER (*Vermont Sta. Bul. 165, pp. 139–240, pls. 8, figs. 3*).—This bulletin is based upon a survey of peat and muck deposits which involved the taking and analysis of 200 samples from different parts of the State. The various uses of peat are discussed.

It is stated that as a fuel "it has many strong points in its favor and while not likely to displace coal and wood, is often worth using. Agriculturally it is used as a fertilizer and soil amendment, as a stable absorbent and litter, as a stock food, and in commercial fertilizer manufacture. Its service as a fertilizer and soil amendment and as a stable absorbent are well worth while, but its use as a stock food or as an ingredient of a commercial fertilizer is less commendable."

Rubber soils, F. WOHLTMANN and MARSHALL (*Tropenpflanzer, 16 (1912), No. 11, pp. 571–581; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 1, pp. 33–35*).—From physical and chemical analyses of samples of typical rubber soils from Bolivia and Brazil, South America, and from different districts in German East Africa, the author concludes that a good rubber soil must be of fine texture, sweet, loose rather than heavy, and deep in order to insure a high water-holding power which seems to be essential to an abundant formation of latex. Loam sands and sandy loams are to be preferred for rubber plantations, whereas laterite soils and soils rich in iron are of doubtful quality, and clay soils as well as any extreme types are of no value.

A high nitrogen content, exceeding 0.1 per cent, is not necessary and a high humus content is probably harmful. The trees seem to be very slightly dependent upon the lime-magnesia ratio and not particularly so on the phosphoric

acid content of the soil. On the contrary, it would seem that a high potash content of the soil stimulates growth and formation of latex.

The soils of Russia (*Rev. Sci. [Paris], 50 (1912), II, No. 8, pp. 245, 246*).—The soil zones and types of Russia are briefly described.

Regarding the soils of Mbala-Wembäre steppes south of Victoria Sea as a basis for the agricultural utilization of the district, P. VAGELER (*Pflanzer, 8 (1912), No. 7, pp. 361–388, pls. 2; abs. in Chem. Zentbl., 1912, II, No. 16, p. 1393*).—The author reports a study of the physical and chemical properties of the soils of the Mbala-Wembäre steppes of German East Africa. A soil map is included.

It is stated that without irrigation the soils of the Mbala plains are of little agricultural value, but that when irrigated and drained adequately rice and cotton may be produced with profit, especially in the southern part of the region. The physical and chemical properties of the soils of the upper Wembäre basins are typical of ideal cotton soils. The soils of the Manyonga plains and of the lower Wembäre basins are valuable cotton soils when irrigated.

Soils from the East Africa Protectorate (*Bul. Imp. Inst. [So. Kensington], 10 (1912), No. 3, pp. 405–422; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 1, pp. 35, 36*).—Mechanical and chemical analyses of a large number of samples from different districts of the East Africa Protectorate are reported and discussed in their relation to crop production. The soils were shown to be as a rule well supplied with potash.

The need of a survey of agricultural soils in South Africa, B. DE ST. J. VAN DER RIET (*So. African Jour. Sci., 9 (1912), No. 3, pp. 23–29*).—This is an address delivered at a meeting of the South Africa Association for the Advancement of Science, in which the author discusses briefly the agricultural value of systematic soil surveys and emphasizes the need of such surveys in a study of the soils of South Africa.

Soil fertility and fertilizers, J. E. HALLIGAN (*Easton, Pa., and London, 1912, pp. IX+397, figs. 23*).—This book, by the chemist of the Louisiana State Station, is a nontechnical treatise intended for "the student, farmer, manufacturer, and other persons interested in the subject of fertilizers." Different chapers treat of chemical elements needed by plants and the composition of plants; the fertility of the soil; maintaining soil fertility; farm manures; high-grade nitrogeneous materials; low-grade nitrogenous materials and functions of nitrogen; phosphates; superphosphates and effect of phosphoric acid; potash fertilizers; miscellaneous fertilizer materials; lime, gypsum, and green manures; commercial fertilizers; valuation of fertilizers; high, medium, and low-grade fertilizers; home mixtures; a few remarks about fertilizers; and fertilizer formulas for crops.

A list of agricultural experiment stations, directions for collecting and exhibiting fertilizer materials, and tables showing the fertilizer constituents in feeding stuffs, are given as appendixes.

For a review of an abridgement of this book see a previous note (E. S. R., 26, p. 521).

Fertilizers, J. T. CRAWLEY (*Porto Rico Sugar Producers' Sta. Bul. 3 [English Ed.], pp. 28*).—A discussion of this subject with special reference to Porto Rican conditions.

Action of water-soluble commercial fertilizer upon porous soils, A. PETTERA (*Illus. Landw. Ztg., 32 (1912), No. 78, pp. 724, 725, figs. 2; abs. in Chem. Abs., 6 (1912), No. 23, p. 3487*).—Observations on such soils led to the conclusion that the danger of loss of soluble fertilizers by leaching is generally overrated.

A biological method of preserving farm manure, C. BARTHEL and S. RUODIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 57, pp. 18*).—A detailed account is here given of studies of the use of whey to preserve manure (E. S. R., 27, p. 623).

[Progress in the manufacture of nitrogen compounds], V. HÖLBLING (*Chem. Indus. [Berlin], 35 (1912), Nos. 20, pp. 644–650; 21, pp. 672–684*).—Various processes which have recently been proposed for the manufacture of nitric acid, nitrates, nitrites, ammonia, and ammonium salts are briefly described. See also a previous note (E. S. R., 27, p. 520).

Losses of combined nitrogen, J. D. PENNOCK (*Jour. Indus. and Engin. Chem., 4 (1912), No. 3, pp. 172–178, figs. 3; Sci. Amer. Sup., 73 (1912), No. 1892, pp. 222–224, figs. 3*).—The paper discusses the waste of nitrogen of the air, freed from oxygen, in coking and ammonia-soda processes, and losses from inorganic and organic combinations. It is stated that in the manufacture of nitric acid from sodium nitrate only from 90 to 93 per cent of the nitrogen is recovered by ordinary processes.

"The waste gases of the precipitating towers of an ammonia-soda process furnish an abundant (2,940 tons per day in this country) supply of nitrogen which would be suitable for the manufacture of cyanamid. The oxygen of the air used to burn the coke in the limekilns is completely converted to carbon dioxid, so that the gas going to the precipitating towers contains only carbon dioxid and nitrogen, and when leaving the tower is practically pure nitrogen, there being 1 to 2 per cent of carbon dioxid, which could be readily absorbed by passing the gas through milk of lime. . . .

"From 1893 to 1910 inclusive the coal coked in beehive ovens, where the volatile nitrogen was ruthlessly wasted in fire, amounted to about 810,000,000 tons. Had this been coked in by-product ovens, the volatile nitrogen of the coal would have yielded 23 lbs. of ammonium sulphate per ton, or a total of 9,315,000 tons."

A complete list is given of by-product and retort coke-oven plants in the United States January 1, 1911.

Nitrate prospects in the Amargosa Valley, near Tecopa, Cal., E. E. FREE (*U. S. Dept. Agr., Bur. Soils Circ. 73, pp. 6, figs. 4*).—The brief reconnoissance reported in this circular showed varying amounts of nitrate in the low rounded clay hills of this valley. The nitrate content of the samples examined was very variable, ranging from almost none to 12.28 per cent. The extent and commercial value of the deposit "is entirely unknown and could be determined only by systematic exploration."

Exploration of salines in Silver Peak Marsh, Nevada, R. B. DOLE (*U. S. Geol. Survey Bul. 530–R, pp. 18, figs. 3; Jour. Indus. and Engin. Chem., 5 (1913), No. 3, pp. 196–198*).—Borings to a depth of 50 ft. in the bed of this dried-up lake showed no extensive beds of potash salts although some samples of brine containing as much as 3.43 and 3.8 per cent of potash were obtained. The marsh was found to be a salt playa containing large amounts of sodium chlorid of high grade.

Exploitation of the potash deposits of Upper Alsace (*Génie Civil, 61 (1912), No. 16, pp. 322–324, pl. 1, fig. 1*).—These deposits and the recent installation of one mine upon them are described. It is estimated that the basin of Wittelsheim, in which the mine is situated, can supply the world with potash (at the present rate of consumption) for about five centuries. The salts mined are of high quality and their purification easy.

Origin and importance of the potash deposits, GRAESSNER (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 2, pp. 363–373*).—The formation, extent, and commercial and economic importance of the German potash deposits are discussed.

How is the failure in the action of a Thomas slag and kainit fertilization upon meadows to be explained? A. GILCH (*Illus. Landw. Ztg., 32 (1912), No. 78, pp. 722, 723; abs. in Chem. Abs., 6 (1912), No. 23, pp. 3486, 3487*).—The failure is ascribed to lack of nitrogen in most cases.

On the alleged refutation of the lime factor theory, III, O. LOEW (*Landw. Jahrb., 42 (1912), No. 1, pp. 181–192*).—This is the third communication on this subject (E. S. R., 24, p. 716), taking issue with the conclusions of D. Meyer (E. S. R., 24, p. 134) and O. Lemmermann (E. S. R., 25, p. 725).

Investigations on plant chlorosis induced by calcium carbonate, P. MAZÉ, RUOT and LEMOIGNE (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 7, pp. 435–437; abs. in Chem. Zentbl., 1912, II, No. 17, p. 1490; Jour. Soc. Chem. Indus., 31 (1912), No. 17, p. 831; Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1088*).—Corn retained its green color in a medium containing an excess of calcium carbonate, while lupines and vetch (*Vicia narbonensis*) under like conditions became chlorotic. The addition of a few drops of 0.02 per cent ferric nitrate to the chlorotic leaves restored the color in a few hours. The authors conclude that the chlorosis was due to the calcium carbonate, preventing the plants from securing the necessary iron by rendering it insoluble. They believe that the corn is able to get the needed iron by means of the acid (malic) excretions of its roots, which dissolve the calcium carbonate and release the iron; the leguminous plants do not produce sufficient acid to do this.

Commercial fertilizers, J. L. HILLS, C. H. JONES, ET AL. (*Vermont Sta. Bul. 166, pp. 243–320*).—This is a report in the usual form of results of inspection of fertilizers in Vermont during 1912, including analyses and valuations of 182 brands representing 19 firms. The quantity and quality of plant food in these fertilizers was as a rule found to be very good.

AGRICULTURAL BOTANY.

The bacterial cell, A. MEYER (*Die Zelle der Bakterien. Jena, 1912, pp. VI+285, pl. 1, figs. 34*).—The author has given a critical summary of our knowledge regarding the bacterial cell. After defining the limits of eubacteria and describing the genera which he believes entitled to recognition under this group, the phylogeny of eubacteria is discussed at some length. He admits the following genera: Bacillus, Spirobacillus, Spirillum, Pseudomonas, Microspira, Streptococcus, Micrococcus, and Sarcina, with numerous subgenera or sections. The main portion of the work is taken up with discussions of the size of bacteria, their structure, the nucleus, cytoplasm, plasmodia, flagella, membranes, vacuoles, nutrition, etc.

A bacterial soil analysis, A. VOĬTKEVICH and A. KOLENEV (*Vĭestnik Bakt. Agron. Stantsiĭ V. K. Ferreĭn, 1912, No. 19, pp. 145–198*).—The authors present a condensed review, with bibliography, of the literature of bacteriological analysis and microbiological reaction of soils, also a report on their own studies with 32 typical soils from the government of Samara in southeast Russia, some specimens being of virgin soil and some of soil under cultivation with and without artificial irrigation. In all cases a count of the bacterial content was made. Tests were made also in case of each soil of its capability for causing decomposition of urea, putrefaction, nitrification or denitrification, assimilation of nitrogen, and fermentation.

The investigations gave results which were, on the whole, unsatisfactory. This is ascribed to the defects of present microbiological methods and to the facts that the soils were taken at different times and under different conditions and that they were a long time in transit, the result being a varied material

little suited to the purposes of comparative study. The bacterial count also gave very different numbers from one and the same soil type. Only the determinations of the nitrogen-assimilating properties of the soils are regarded as successful. These experiments were carried out with 1 per cent solution of mannit, 10 gm. of soil being added to 100 cc. of the solution, which was kept at room temperature for 6 weeks. Cultivated soils gave an average of 8.9 mg. and virgin soils 4 mg. of assimilated nitrogen.

Bacteriological analyses of different preparations of bacteria for soil inoculation, L. BUDINOV (*Vĭestnik Bakt. Agron. Stantsii V. K. Ferreĭn, 1912, No. 19, pp. 67–103*).—The author, reporting on the work of this station done in collaboration with several other stations, gives the estimate arrived at in regard to the bacterial content of each of several preparations offered for soil inoculation.

A collective test investigation of preparations of bacteria for soil inoculation, II, S. SEVERIN (*Vĭestnik Bakt. Agron. Stantsii V. K. Ferreĭn, 1912, No. 19, pp. 104–130*).—This is a report of the comparative tests made by the bacteriological-agronomic institution at Moscow in 1910 on clover, alfalfa, peas, vetches, barley, maize, and cotton to test the effects of several preparations of bacteria for soil inoculation.

The tests made on potted plants were unsuccessful, not one giving perceptible results. Of those on soil plats, a number showed a fairly high percentage of successes. The highest percentage, 75 per cent, was obtained from 4 tests of nitragin prepared by the U. S. Department of Agriculture; then in order of percentages follow the dry nitragin of the Moscow station with 64 per cent; that of Moore, 60 per cent; the liquid nitragin of the Moscow station with 57 per cent; and that of Bottomley with 46 per cent.

The relation of cultivated plants to soil salts, III, B. HANSTEEN CRANNER (*Nyt Mag. Naturvidensk., 50 (1912), No. 2, pp. 129–133*).—The author's investigations, made on cell walls of certain physiologically active cells, showed that such walls contain constituents which he considered to be of the highest significance in the interchange of certain substances in determining the life activities of the plant. These substances consist of fatty acids and are found in numerous parts of many widely divergent plants. They are never found singly, but always in a characteristic mixture in the cell walls of a given plant or part. Without exception, it is said, they are characterized by (1) insolubility in water even at the boiling point; (2) ready solubility in alcohol even when cold; (3) melting point as low as from 30 to 53° C.; (4) a readiness to form soaps; and (5) ready solubility of the alkaline salts in both water and alcohol, the calcium salts being insoluble in water but readily soluble in boiling 95 per cent acohol.

The assumption is made that cell walls provided with acids of such properties may play an active part in the movement of materials to or from such cells, that is, in supply or excretion. Experimentation is held to bear out this assumption. Artificial cellulose membranes impregnated with calcium soaps were found to absorb water from a moist atmosphere and give it up to a dry one more readily than did a pure membrane. This difference was accentuated in case of alkaline soaps. In experiments with plants, the same general relations were found to hold, but here in case of a calcium solution water was given up more readily to the atmosphere than in case of potassium solution.

The author holds that the above assumption gives an unforced explanation of numerous observed relations, as peculiarities of root secretion, the relations of plants to chemically different soils, etc.

The effect of guanidin on plants, O. SCHREINER and J. J. SKINNER (*Bul. Torrey Bot. Club, 39 (1912), No. 11, pp. 535–548, figs. 6*).—In continuation of a previous preliminary note (E. S. R., 27, p. 27) a report is given of investigations

on the effect of guanidin on wheat and other seedlings, in which it was found that guanidin, as carbonate, is harmful to wheat, corn, cowpeas, and potato plants, producing conditions resembling some physiological disturbance. The plants remain normal for a few days, after which they exhibit a spotted appearance on leaf and stem, followed by the final collapse of the plants.

The harmful effect of guanidin on plants was augmented by the presence of nitrate and increased with the amount of nitrate present. Other sources of nitrogen did not show this effect. The organic nitrogenous compound asparagin, as well as creatinin, appeared able to counteract the effect of guanidin.

The influence of alternations of humidity and dryness on the germination of seeds in case of some weeds, O. Munerati and T. V. Zapparoli (*Malpighia, 24 (1912), No. 4, pp. 313–328, figs. 5*).—In continuance of studies on conditions influencing germinability (E. S. R., 27, p. 132), the authors investigated the effects of continuous moisture and of moisture during short periods (15 days) followed by equal or longer periods (3 months) of dryness.

It was found that, while exhibiting great diversity as regards behavior in germination, the seeds studied fell into 3 general groups: (1) Seeds of *Vicia segetalis, V. hirta, Convolvulus sepium*, and *Galium aparine* showed rates of germination not widely different from the differences or variations of moisture employed. They either germinated quickly or with remarkable slowness, but always with considerable uniformity. (2) Seeds of *Avena fatua, Daucus carota, Myagrum perfoliatum*, and *Capsella bursa-pastoris* acquired with alternation of moisture and dryness a readiness in germination not shown by seeds of the same lots when subjected to constant moisture in the surrounding medium. (3) *Rumex crispus* and some others showed in a constantly moist medium a low germinability but preserved vitality for a long while, germinating on suitable alternation of dryness with moisture. It is thought that allowance must probably be made for the difference between laboratory conditions and natural conditions of germination of these seeds.

The influence of warm baths on the respiration and germination of resting plants, P. P. Iraklionow (*Jahrb. Wiss. Bot. [Pringsheim], 51 (1912), No. 4, pp. 515–539, figs. 4*).—Already noted from another source (E. S. R., 27, p. 220).

The first stages of development in the Gramineæ, A. A. Bieliaev (*Izv. Moskov. Selsk. Khoz. Inst. (Ann. Inst. Agron. Moscou), 18 (1912), No. 2, pp. 193–198, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 1960, 1961*).—It is stated that experiments with Gramineæ seem to show that, in addition to its protective character and office, the coleoptile has the function of transmitting to the seedling the light impressions which influence the formation and position of the first node. The results of numerous studies on the morphological and physiological significance of the coleoptile are given. From studies on barley and oats planted in sand at from 1 to 10 cm. depth, it is claimed to have been shown that the length of the coleoptile is in close relation to the depth of the sowing. The distance of the first node from the surface of the ground is also nearly in direct proportion to the depth of the sowing but not exactly, as the plant shows a tendency to form its first node in proximity to the surface of the soil and neutralize the effect of deep planting by increase of the growth of the first internode, this last effect being attributed to the lessened illumination at the greater depth. It is suggested that by sowing at proper depth it is possible to secure a position of the first node sufficiently low to lessen materially the danger from frost.

The respiration of green plants, L. Maquenne and E. Demoussy (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 17, pp. 753–758*).—The authors discuss some fluctuations noted in the respiratory quotient of parts of a number of plants as influenced by a number of factors, such as darkness, temperature,

duration of the experiments, etc. They claim that when the true respiratory quotient of any organ detached from a plant is studied the parts should be kept as nearly in equilibrium and at the same temperature as when detached, and the experiments should be conducted for a relatively short period. Where comparisons are made of two experiments of unequal duration, the one showing the higher figures will more nearly represent the true respiratory quotient.

Alcohol utilization in plant respiration, W. Zaleski and A. Reinhard (*Biochem. Ztschr., 42 (1912), No. 1, pp. 39–43*).—Previous investigations (E. S. R., 26, p. 729) having led to the supposition that the production of carbon dioxid by pulverized peas is conditioned by alcoholic fermentation while analyses showed less alcohol than this view would require, the authors tested the assumption of a possible oxidation of alcohol by passing a stream of hydrogen and one of air through a receptacle containing a layer of pulverized animal charcoal moistened with alcohol.

Little or no diminution of alcohol was noted in the first case, but considerable in the second, a result considered favorable to the hypothesis. The authors hold that it is not necessary to assume the presence of ferments in any of the experiments here referred to and that the influence of ferments in alcoholic fermentation may have been overrated. They promise a discussion later of the question whether in the experiments of S. Kostytschev (E. S. R., 22, p. 721) oxidation of an intermediate product of alcoholic fermentation may have occurred.

The influence of marked variations in temperature on the respiration of plants, L. Blanc (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 1, pp. 60–63*).—The author has examined the claim of Palladin (E. S. R., 12, p. 112) that sudden changes in temperature affect the respiration of plants, and from experiments which he has carried on with embryos of *Phaseolus vulgaris*, etiolated shoots of *Vicia faba*, and rye seedlings he found that marked changes in temperature did not determine changes in respiration. Between the respiration at a given temperature and that of a given degree the change was found to be so gradual that the respiratory activity of all temperatures between the two extremes was included.

Nitrogen assimilation and protein building in plant cells, O. Loew (*Biochem. Ztschr., 41 (1912), No. 3–4, pp. 224–240*).—In further support of his views (E. S. R., 27, p. 332) as opposed to those of O. Baudisch (E. S. R., 27, p. 226), the author holds (1) that the reduction of nitrates and sulphates in plant cells does not depend upon the direct chemical action of light; (2) that the reddening of phenolphthalein by water plants in light indicates the formation of calcium carbonate rather than that of alkaline carbonates; (3) that protein formation in plants is not dependent upon either the partial oxidation of ammonia or illumination; (4) that the relative acceleration of such formation during illumination of leaves is partly an expression of the increased energy of the protoplasm and partly a result of increased carbohydrate formation as evidenced by the fact that lower fungi do not exhibit such influence; (5) that asparagin may be considered a reserve form for ammonia as well as for an intermediate product in the progress of protein formation; and (6) that a number of facts favor the view that a condensation process is involved in protein formation.

The electrolytic effect of a continued current on plant cells, F. Kövessi (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 1, pp. 63–66*).—In a previous publication (E. S. R., 27, p. 28) the author showed the effect of a continued current on the germination and growth of plants, and he has reported additional investigations which indicate that there is not only a direct but also an indirect influence exerted by the current on plants. The direct influence on the

plants is based on electrolytic phenomena. The protoplasmic membrane under the influence of electricity loses its semipermeable nature and permits the electrolytes to escape from the cells. Under the action of electricity the albuminoid substances in the cells behave in a similar manner to the electrolytes, their ions escaping from the cell and distributing toward the positive or negative electrodes in proportion to their electrolytic nature.

Studies on necrobiosis and on the lethal effects of chloroform, T. WEEVERS (*Rec. Trav. Bot. Néerland., 9 (1912), No. 2, pp. 236–280, fig. 1*).—Regarding his investigations on the effects of chloroform vapor at both constant and variable temperatures and pressures, as exhibited in changes of appearance and in products, the author reports substantially as follows:

Phanerogams show very diverse chromogens as the result of poisoning with chloroform vapor. The black pigment noted in the Salicaceæ is due to the formation of catechol. In chloroform necrobiosis, the enzyms remaining active after death of the tissue, the formation of pigments may follow as well as that of aromatic and volatile substances. This appears to be due not to a greater enzymotic activity under the influence of the anesthetic but to changes favored by the greater permeability of the cell membranes. The time required for necrobiosis varies greatly, ranging from less than 5 seconds in case of epidermis of the floral leaves of magnolia to 1 or 2 hours in case of mature leaves of cherry laurel. The time depends in part upon the water content of the tissue in question, air-dry peas germinating after exposure for 10 days. The time required for necrobiosis shows a variation approximately proportional inversely to the square of the chloroform vapor pressure.

Investigations on the presence of nitrous acid in the sap of plants, P. MAZÉ (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 17, pp. 781–783*).—The author reports having found in the exudate from the water pores of maize in addition to disastases two substances, nitrous acid and an organic substance that is capable of overcoming the yellowing effect of chlorosis.

In his experiments conducted with maize under aseptic conditions, in which the plants were furnished with mineral nutrients, and from tests made with water exuded from cabbage, millet, poppy, etc., in the open field, the author claims to have found nitrous acid a normal constituent of the sap of plants, and it is believed to be a direct product of the living cells and not derived by the reduction of nitrates. Its concentration is in inverse proportion of the activities of the plant.

A new group of plants containing hydrocyanic acid, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 17, pp. 783, 784*).—The author reports having determined the presence of hydrocyanic acid in species of Calycanthus and Chimonanthus. The acid, he states, does not occur in the free state, but is a result of the action of an enzym on a glucosid.

The storing of reserve materials in fungus galls, H. C. SCHELLENBERG (*Verhandl. Schweiz. Naturf. Gesell., 94 (1911), I, pp. 277–279; abs. in Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 10–13, p. 321*).—It is stated that the formation of galls by fungi is due to the collection of material which is utilized by the fungi, as in case of *Gymnosporangium sabinæ* on pear leaves. It is claimed that these stored materials differ from such materials found elsewhere in the plant only in having a higher concentration at the points at which they have been collected from parts of the plant not affected by the fungi. This higher concentration is asserted to be due to the fact that the fungus has the power to alter the osmotic properties of the cell-complexes. The galls are said to be primarily storing tissue, other functions being secondary.

The relation of mold-fungi to cane sugar, G. E. RITTER (*Biochem. Ztschr., 42 (1912), No. 1, pp. 1–6*).—The author's experiments with the growth of 7 dif-

ferent fungi, continued for from 12 to 16 days, showed that, in general, their capacity for assimilating saccharose was much less than that for glucose. Cases of apparent exception to this led to the assumption that such fungi were able to invert cane sugar, which further investigations are said to verify.

The nutrition physiology of mycotrophic plants, H. WEYLAND (*Jahrb. Wiss. Bot.* [*Pringsheim*], *51 (1912), No. 1, pp. 1–80, pl. 1, figs. 8*).—This is an attempt at a chemico-physiological study of the nutritive relations of mycotrophic plants with their root fungi. Although most of the questions involved are regarded as still open, it seems to be the author's opinion that the association is one of genuine symbiosis so far as a number of nutritive compounds are concerned, and that in the numerous detailed observations here recorded encouraging progress has been made toward more fruitful investigations.

Studies on the autotropic readjustment of geotropic and mechanical curves of roots, S. V. SIMON (*Jahrb. Wiss. Bot.* [*Pringsheim*], *51 (1912), No. 1, pp. 81–176, figs. 6; abs. in Bot. Centbl., 120 (1912), No. 23, pp. 597–599*).—This is an account of the author's investigations carried out with plantlets of *Vicia faba*, *V. equina*, *Lupinus albus*, and *Zea mays* in regard to the adjustive movements of the root tips after having been subjected to geotropic and mechanical bending.

It appears that the legumes examined showed two phases of adjustment, one called here the primary phase extending to the time of cessation of growth and the secondary phase extending beyond that point. *Z. mays* showed great differences as regards adjustment, some roots giving little or none. The detailed results are given in numerous tables.

A simple demonstration of the action of natural selection, J. A. HARRIS (*Science, n. ser., 36 (1912), No. 934, pp. 713–715*).—A report is given of a biometric investigation on selective mortality, made with a series of about 238,000 bean seedlings which were examined for morphological variations to serve as a basis for experiments in selection within the pure line.

Of 5,030 normal plants, 4.493 per cent died, while of 4.217 seedlings showing morphological variations from type, 6.782 per cent failed to reach maturity. The material studied was divided into 16 lots of about 10 pure lines each, and in all but one of the series the death rate was higher in the abnormal than among the normal plants. This fact is briefly discussed in its relation to natural selection.

The variability of Œnothera lamarckiana and the problem of mutation, N. HERIBERT-NILSSON (*Ztschr. Induktive Abstam. u. Vererbungslehre, 8 (1912), No. 1–2, pp. 89–231, pls. 3, figs. 36*).—The author discusses in the light of his recent studies the variability of *Œ. lamarckiana* with special reference to the coloring of the veins and other portions of the leaves, the height of the plant, number of styles, form of flowers, etc., and whether the differences noted are sufficient to be considered mutations. He also discusses the variability of the so-called giant races, the species crossing, etc., after which he gives a criticism of the experiments of de Vries with this plant.

The author claims that *Œ. lamarckiana* is a hybrid, that the mutants represent some of its variations, and that it is not an elementary species, as is generally held, but one that shows a great range of characters, many of which segregate according to Mendelian principles of dominance.

An extensive bibliography completes the work.

Mutation of Aspergillus niger, ELISABETH SCHIEMANN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 8 (1912), No. 1–2, pp. 1–35, pls. 2, figs. 18*).—As a result of cultures of *A. niger*, the author has established two constant mutants, which are designated as *A. fuscus* and *A. cinnamomeus*.

A case of xenia in beans, J. DANIEL (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 1, pp. 59, 60*).—The author briefly describes a case of xenia that occurred as a result of crossing two species of beans (*Phaseolus multiflorus* and *P. vulgaris*). The behavior of the subsequent generations of the hybrids is to be studied later.

FIELD CROPS.

[Field crops experiments in Alaska], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1911, pp. 17–19, 24–26, 27–29, 33–44, 47–53, 59–61, 66, pls. 5*).—The field-crop work at Sitka was confined to the test of a long list of varieties of potatoes on comparatively small plats. Gold Coin, grown in a single row 1,170 ft. long, the largest plat in the test, yielded at the rate of 456 bu. per acre.

At the Rampart Station work was continued in the cross-breeding of barley. A beardless hybrid under test matured in 80 days and showed other qualities of value under Alaska conditions. Selections were also made of the earliest maturing and best individual plants from each of a number of the best varieties. The improvement of oats was attempted by selection only. Finnish Black again ranked as the best variety, but Great Mogul, a black oat, and Banner and Swedish Select, white varieties, also gave promising yields. In tests of winter grain, winter rye proved much hardier than winter wheat. Kharkov, the hardiest variety of winter wheat tried, was badly winterkilled in the winter of 1911–12. It was found that this variety needs a winter protection of at least 30 in. of snow. The more resistant varieties of winter rye were winterkilled from 25 to 50 per cent.

In a series of fertilizer tests with oats, sodium nitrate, potassium sulphate, and superphosphate were applied singly and combined at the rate of 500 lbs. per acre. The average percentage of increase from the use of sodium nitrate was 22 per cent, from the mixture of all 3 fertilizers in equal parts 14 per cent, from potassium sulphate 12½ per cent, and from superphosphate 2⅓ per cent. A fertilizer test with potatoes with these same applications resulted also in favor of sodium nitrate, being followed by the complete mixture. All fertilizer experiments thus far conducted have indicated that nitrogen is the element deficient in the soil.

Experiments with potatoes showed that Extra Early Eureka, Extra Early Pioneer, Extra Early Triumph, Irish Cobbler, Gold Coin, Hamilton Early, and Early Ohio are of good quality and appear adapted to the conditions of the interior. Irish Cobbler is regarded as especially well adapted to culture in that region on account of some of its favorable qualities, such as sufficient toughness of skin, which facilitates its handling as a market variety.

Among the varieties of grasses grown awnless brome grass came through the second winter in good shape and made an early spring growth. An acre of the grass yielded fully a ton of fine hay. Timothy seeded with the brome grass wintered perfectly but made a very light yield. Red fescue and Kentucky blue grass are reported as also making promising growth. A number of legumes, including *Vicia cracca*, Mountain alfalfa, Grimm alfalfa, sand lucern, and alsike clover survived the second winter in good shape and made a fair growth. *V. cracca* and alsike clover were the only ones that produced seed. Turkestan alfalfa made a good growth and was mowed the first week in September. Several hundred alfalfa plants, representing the varieties of Siberian alfalfas grown at the South Dakota Station, were set out, and although not all lived, those that survived shipment and transplanting made a fair growth.

At the Fairbanks Station 27 varieties of potatoes were grown in 100-ft. rows and all made good yields. Three acres of Eureka, Early Ohio, and Gold Coin averaged 6 tons per acre over the field on second year unfertilized ground.

Five acres of timothy drilled thickly on June 23 soon covered the ground and made a growth of from 6 to 10 in. during the season. A few leading varieties of wheat, oats, and barley were selected and seeded in plats 30 by 30 ft. on May 30. These grains all came up very quickly and made such a rank growth that they lodged before the heads were completely formed. This retarded the ripening but all matured good seed. Three varieties of spring wheat and one of spring rye all filled well but had not fully ripened before the killing frost of August 31. A half acre of North Finnish oats seeded on May 16 was headed by July 4 and thoroughly ripe and harvested August 11, the earliest to ripen of any known spring seeding in the locality. An acre of Banner oats seeded June 1 on high land sloping slightly to the north matured and was harvested for seed. Kharkov winter wheat and 2 fall ryes seeded August 5 were partly winterkilled, but matured perfectly by August 10 the next year. Oats was again grown successfully for hay.

At the Kodiak Station over 100 tons of dry hay were put up from the native grasses and a large quantity of silage was procured from the same source. The hay and silage were made principally from the beach grass but about 25 tons of native blue top were put up for silage to test its properties.

Notes are given on cooperative culture tests by farmers in the region of Copper Center.

Trials with alfalfa of different origin, P. HANSEN (*Tidsskr. Landbr. Planteavl, 19 (1912), No. 3, pp. 377–411*).—Trials were conducted at 3 Danish experiment stations during the years 1900 to 1911 with 55 kinds of alfalfa seed grown in Hungary, Germany, France, Italy, Russia, Spain, Turkestan, and the United States.

The alfalfa from the Hungarian seed gave the largest crop of hay for 3 consecutive years and proved best under Danish conditions. German sand lucern ranked next in value, being followed in the order mentioned by French, Italian, and Russian alfalfa. The American, Spanish, and Turkestan alfalfas gave only small yields.

Experiments on cutting alfalfa at Bornholm, P. HANSEN (*Tidsskr. Landbr. Planteavl, 19 (1912), No. 3, pp. 412–420*).—From 1908 to 1911, different plats of alfalfa at the Aakirkeby experiment station were cut 1, 2, 3, or 4 times during the season.

By cutting only once every year a large hay crop was secured, the plats were easily kept clean, and the plants were vigorous, but the quality of the hay was reduced through woody stems and a large loss of leaves. These objections were less pronounced with 2 cuttings a year, while 3 cuttings gave the largest yields of hay of good quality with the smallest loss of leaves. The finest quality of hay was obtained with 4 cuttings but the yields secured even from excellent stands were considerably lower than from the other plats and the stand was gradually weakened, thus favoring the growth and the spreading of weeds.

Winter barley, H. B. DERR (*U. S. Dept. Agr., Farmers' Bul. 518, pp. 18, figs. 4*).—After presenting notes on varieties of winter barley, the regions in which the crop is grown, and the soils which are adapted to it, the author discusses fertilizers and manures, rotations with reference to barley, preparations of the seed and the seed bed, sowing the seed, and cultivating, harvesting, and improving the crop. Brief notes are also given on the various uses of winter barley.

A trial with white clover of different origin at Svalöf, H. WITTE (*Sveriges Utsädesför. Tidskr., 22 (1912), No. 5, pp. 273–283, pl. 1, fig. 1*).—Nine varieties of white clover of Danish, German, English, and Italian origin were grown in small plats from 1910 to 1912. The Danish seed gave the largest average yields and the best stand during the second and third seasons.

Studies on climate and crops. IV, Corn crops in the United States, H. ARCTOWSKI (*Bul. Amer. Geogr. Soc., 44 (1912), No. 10, pp. 745–760, figs. 16*).—This is a continuation of a series of articles on this subject (E. S. R., 23, p. 732) and gives the results of a study of the geographical distribution of the corn crop for the years 1891 to 1909 as shown by census figures and statistics published by this Department. Certain suggested correlations with climatic conditions are briefly discussed.

Cultivation of cotton in Russian Asia, M. LAUWICK (*Rev. Écon. Internat., 9 (1912), IV, No. 3, pp. 502–522, fig. 1*).—This article discusses the possible development of Russian industries without American cotton, and the possibility of increasing the production of cotton in Turkestan. The obstacles noted in the way of an increased production are the high cost of living, high wages, and an inadequate credit system.

Cotton in the Orient and on the Mediterranean, Y. M. GOBLET (*Rev. Écon. Internat., 9 (1912), IV, No. 3, pp. 523–544*).—Historical observations are made concerning cotton production in America and the Orient, and the quality of the products, extension of the industry and the general economic consequences of an increase of cotton growing around the Mediterranean Sea are discussed.

Packing and marketing of cotton, J. M. CARSON (*U. S. House Representatives 62. Cong., 3. Sess., Doc. 1175, pp. 39, pls. 8*).—This document presents a study of the present wasteful methods of packing and marketing cotton, together with suggestions for their improvement in the way of baling, handling, storing, sampling, selling, shipping, compressing, etc. Their importance is illustrated by showing that while only about 2 per cent of the corn and 13 per cent of the wheat produced in the United States are annually exported, over 65 per cent of the cotton is sold in foreign countries, bringing to the United States in exchange $559,000,000 in 1911, a sum about equal to the balance of trade.

Lime-sulphur v. Bordeaux mixture as a spray for potatoes, II, M. T. MUNN (*New York State Sta. Bul. 352, pp. 319–326, pl. 1*).—The experiments reported were in the main a repetition of previous work and the results essentially a confirmation of data already noted (E. S. R., 27, p. 237). The experiment field included 15 rows 212 ft. long, of which 5 each were sprayed with Bordeaux and lime-sulphur and 5 were left unsprayed. The concentrated lime-sulphur solution consisted of 38 lbs. of 95 per cent pure lime, 80 lbs. of high-grade finely divided sulphur, and 50 gal. of water which was diluted at the rate of 2 gal. of the concentrate to 50 gal. of water. The Bordeaux mixture used was prepared according to the 6:4:50 formula. The first application made July 9 when the plants were from 6 to 8 in. high was followed by other applications at intervals of 2 weeks, 6 applications being made in all.

The use of the Bordeaux mixture prolonged the life of the plants about 2 weeks and increased the yield of marketable tubers at the rate of 111.5 bu. per acre, while rows receiving 6 applications of lime-sulphur died earlier even than the check rows. Tip burn and late blight (*Phytophthora infestans*) were largely controlled by the Bordeaux mixture, while lime-sulphur dwarfed the plants and aggravated the tip burn, although it did not appear to burn the foliage. The results further indicated that the effect of lime-sulphur on the late blight and rot is uncertain.

Lime-sulphur not a good potato spray, F. H. HALL (*New York State Sta. Bul. 352, popular ed., pp. 2*).—A popular edition of the above.

Potato spraying in 1911, B. F. LUTMAN (*Vermont Sta. Bul. 162, pp. 36–45, fig. 1*).—The experiments here reported in continuation of previous work (E. S.

R., 26, p. 53) were undertaken to throw further light on the stimulation of potato plants by the application of Bordeaux mixture. It has been observed that sprayed as compared with unsprayed potato plants yield more tubers even when no fungus diseases occur and an effort was made to determine whether this is due to a daily increase in the amount of starch produced within the sprayed plants on account of the application of the copper mixture, or to an increase in amount of starch brought about by the lengthened life of the plant during September, sprayed plants, as a rule, living from 10 days to 2 weeks longer than unsprayed ones.

To determine whether an actual daily increase resulted, potatoes were harvested at various times. The first harvest on September 2 yielded 194.8 bu. per acre from the sprayed and 170 bu. from the unsprayed plats; the second, September 16, 299.8 bu. from the sprayed and 210.8 bu. from the control area; and the final harvest, October 20, showed 240.3 bu. per acre from the sprayed plats and 202.1 bu. from the unsprayed.

Other compounds described in the bulletin were compared on acre plats with ordinary 5:5:50 Bordeaux mixture to observe the relative effect on the yield. In every case where copper was used the plat showed an increase over unsprayed plats, but the best results were secured where the ordinary Bordeaux mixture had been applied. A plat sprayed with silver-nitrate-soap yielded less than the control plat. In general, the results seem to confirm the deduction made from the previous work that the application of Bordeaux mixture brings about a daily increase in the amount of starch produced per plant.

A summary of the results obtained at the station during 21 seasons' work in potato spraying shows an average yield per acre for the period of 263 bu. for the sprayed plats and of 159 bu. for the unsprayed plats, or an increase of 65 per cent. During the 4 years 1908–1911, inclusive, when there was absolutely no blight, the sprayed potatoes yielded an average of 66 bu. per acre, or 50 per cent, more than did the unsprayed crop.

Work of the pure-seed laboratory, H. L. Bolley (*North Dakota Sta. Rpt. 1911, pt. 1, pp. 61–98, figs. 2*).—Brief notes are given on the equipment of the seed laboratory and a summary of the number of samples of seed tested and their average percentage of purity and germination is presented in tabular form.

Various points with reference to seeds of certain crop groups and regarding the characteristics of the seed of particular crops are discussed. The number of species of foreign seeds found in the samples examined was as follows: Alfalfa 100, brome grass 103, alsike clover 30, red clover 97, flax 122, millet 43, oats 40, timothy 90, and wheat 62.

Notes are also given on cooperative experiments in progress with wheat and with small seeded Russian sunflower grown for oil production. The results of a limited experiment in planting wheat in trenches 10 in. deep and drawing soil to the plants as they grow for the purpose of observing the influence of this treatment upon tillering showed that clean soil and clean seed are a necessity as root diseases destroyed the plants.

Experiments to test the growth of hard seeds of clover and alfalfa in different kinds of soil showed in general a low percentage of germination and indicated that such seeds must be treated in some manner to make them more viable. The results of treating a large number of samples with hot and cold water, steam, different chemicals including sulphuric acid, various kinds of soil, and also scratching the seeds are reported in a table and briefly noted. A considerable range in the possible treatment of hard seeds was found to exist.

HORTICULTURE.

Botanical guide for planters, colonial officers, tropical merchants, and ready reference, H. WINKLER (*Botanisches Hilfsbuch für Pflanzer, Kolonialbeamte, Tropenkaufleute und Forschungsreisende. Wismar, 1912, pp. VII+322*).—A popular reference work to some 1,200 species of plants of more or less economic importance in the Tropics. The species are arranged alphabetically and briefly considered with reference to their botanic classification, habitat, distribution, important characteristics, cultural requirements, products, exploitation, and commercial importance.

Practical plant breeding, J. K. SHAW (*Ann. Rpt. Vt. State Hort. Soc., 9 (1911), pp. 74–82*).—The author here discusses some fundamental principles of plant breeding, his paper being based largely upon experiments with garden peas conducted at the Massachusetts Station (E. S. R., 24, p. 228).

Recent investigations dealing with the annual periodicity of plants, especially woody plants, G. LAKON (*Naturw. Ztschr. Forst. u. Landw., 11 (1913), No. 1, pp. 28–48*).—A critical review of recent investigations on this subject. A bibliography of consulted literature is appended.

The influence of nutrient solutions on the winter rest of woody plants. A new forcing process, G. LAKON (*Ztschr. Bot., 4 (1912), No. 8, pp. 561–582, figs. 2*).—Acting upon the opinion advanced by Klebs that periodicity of growth in plants depends very largely upon climatic and nutritive conditions (E. S. R., 27, p. 522), the author conducted a number of experiments in the fall of 1911 and the winter of 1912 to determine the value of a nutrient solution for overcoming the rest period of plants. The tests were made with branches of lilacs, hornbeam, linden, sycamore-maple, hazelnut, horse-chestnut, magnolia, beech, ash, and several kinds of oak, and were conducted both in the early rest period and during the middle or deepest rest period. A part of the branches was placed in vessels containing Knop's solution; the remaining part was placed in vessels containing water. The branches were then submitted to a temperature ranging from 15 to 20° C.

The results in general show that nutrient salts do exert an unmistakable influence on the rest period of plants. In some cases the rest period was shortened between 2 and 3 weeks. In most cases both the leaf and flower buds were forced out normally. The nutrient solution was also effective in forcing out branches which had been previously dried in a higher temperature.

In connection with these experiments the author reviews the European literature relative to methods of influencing the rest period of plants.

Forcing plants by means of nutrient salts, G. LAKON (*Möller's Deut. Gärt. Ztg., 28 (1913), Nos. 2, pp. 18–20, fig. 1; 3, pp. 31, 32, figs. 2*).—The author here reviews the more practical results secured in the above investigation in order to stimulate the testing of the nutrient forcing method by gardeners. The so-called Knop's solution used in the author's work consisted of 1 gm. of calcium nitrate, 0.25 gm. magnesium sulphate, 0.25 gm. acid potassium phosphate, and 0.25 gm. muriate of potash in 1 liter of water.

The garden patch, E. D. FLINT (*Los Gatos, Cal., 1912, pp. 87*).—A popular treatise on vegetable growing.

Vegetable growing in Holland, WEIRUP (*Arb. Deut. Landw. Gesell., 1912, No. 232, pp. 40, figs. 22*).—An account of the trucking industry in Holland based on the results of an inspection trip conducted by the German Agricultural Society.

[**Horticultural investigations in Alaska**], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1911, pp. 10–17, 19–23, 26, 27, 44, 45, 47, 66, pls. 4*).—The hybridization of cultivated strawberries with the wild native strawberry of the coast region

(E. S. R., 25, p. 836) was continued. Thus far more than 100 varieties have been produced which yield more and larger berries than either parent and which appear to be entirely hardy and suited to the wet climate of the coast region; 15 of these have been selected for propagation and special care. Some 4,000 young plants have not yet fruited. It is not expected that these hybrid plants will have any value in the warmer and drier climate of the States, and until tests have proved the contrary, it can not be assumed that hybrid plants from the coast region will be of much value in the interior of Alaska.

The results secured with apples during the year are much more encouraging than any previously noted (E. S. R., 25, p. 836). Favorable weather conditions prevailed in the fall and a number of varieties with crab blood produced small to medium-sized fruit of good quality, which matured about the middle of October. The varieties which fruited were the Yellow Transparent, Raspberry, Sylvan Sweet, Whitney, Hyslop, and *Pyrus baccata*, the last named being a wild species introduced from western Asia. The trees which yielded fruit were 8 years old. Many other varieties are being tested. A few seeds were secured from attempted crosses of the native crab apple with pollen from early maturing, hardy varieties growing at the South Dakota Experiment Station. It is hoped by making such crosses to secure hardy varieties suited to the climatic conditions of Alaska.

The attempt to acclimate cherries and plums is still giving rather indifferent results. Notes are given on the behavior of different varieties of gooseberries, currants, and raspberries. The work with small fruits, as a whole, indicates that all the hardy fruit bushes do remarkably well in southeastern Alaska and the currant and red raspberry do well all over the interior. The crosses of the Cuthbert raspberry with the pollen of the salmonberry (*Rubus spectabilis*) have proved to be of no material value. Long-continued tests have shown that blackberries, dewberries, loganberries, and grapes will not thrive in Alaska.

The usual trials of different kinds of vegetables were continued at the Sitka Station during the year and the results of these comparative tests, based on a number of years' observations, are reported. A list is also given of hardy perennials which bloomed at Sitka Station in 1911.

Some notes are given of vegetable tests conducted at the branch stations.

Report of the horticulturist, H. J. EUSTACE (*Michigan Sta. Rpt. 1912, pp. 194, 195*).—A comparative test of apple scions taken from water sprouts and scions taken from fruiting wood was started in 1909. The scions were grafted on Paradise stock. Observations of the varieties which have not fruited do not show any difference due to the different kinds of wood used as scions.

Spraying experiments conducted to determine the comparative value of Bordeaux, self-boiled lime-sulphur, and commercial lime-sulphur indicate that the commercial lime-sulphur can be used with safety on cherries and European plums. It does not appear to be safe on Japanese plums or on peaches.

Annual report of the South Haven Experiment Station, F. A. WILKIN (*Michigan Sta. Rpt. 1912, pp. 195–197*).—Notes are given on a number of varieties of apples not commonly grown in Michigan which have done well at the station during the past few years, together with notes on promising varieties of peaches and small fruits.

During 1911 a comparative test of the effects of Bordeaux, commercial lime-sulphur, and self-boiled lime-sulphur was made in nearby apple and peach orchards. Diseases were not serious during the season but some differences were noted in the general appearance and color of the fruit and foliage in the apple orchard. The trees sprayed with commercial lime-sulphur produced smoother and better colored fruit than trees sprayed with self-boiled lime-sulphur or Bordeaux. Bordeaux-sprayed trees showed a very good color on

the foliage but not so bright a color on the fruit. Self-boiled lime-sulphur did the least damage to peach foliage.

[List of fruits for Illinois] (*Trans. Ill. Hort. Soc., n. ser., 45 (1911)*, pp. *17–20*).—This comprises a variety list of orchard and small fruits recommended by the district horticultural societies for northern, central, and southern Illinois. A list is also given of ornamental plants and trees for central Illinois.

Report of a special inquiry into fruit growing conditions in Canada, 1911, W. H. BUNTING (*Ottawa: Dept. Agr. Canada, 1912, pp. 84, pls. 16*).—This embraces the results of a detailed survey of the fruit industry of the various Provinces of Canada. It deals with the nature and extent of the industry, methods of production and orchard management, marketing conditions, and the possibilities of extending the industry in various sections.

The cider apple and the best fruits for pressing, E. FAU (*Le Pommier a Cidre et les Meilleurs Fruits de Pressoir. Paris, 1912, pp. 111, pls. 32, figs. 30*).—Part 1 of this work deals with the culture of fruits intended for pressing and part 2 comprises a monograph of the more important varieties of apples and pears used in making cider and perry. Under each variety is given a description of the tree, fruit, and flowering season, together with the character and analysis of the juice. A number of the varieties are illustrated.

Investigation on the effects of grafting, H. VERDIÉ (*Bul. Soc. Agr. France, 1912, Dec. 1, pp. 362–373; Dec. 15, pp. 423–428*).—This comprises a report of the committee appointed by the Society of Agriculture of France to investigate the effects of grafting on the yield and quality of grapes and wine. The subject matter relates in detail to observations made in various experimental vineyards in southwestern and central France. The committee concluded in substance that where the factors of adaptation and affinity of stock and scion, as well as other necessary conditions for successful grape culture, have been realized, there appears to be nothing to warrant the claims that grafting has a deleterious effect on the yield and quality of the product.

On the conservation of table grapes in carbon dioxid and in ground cork, F. A. SANNINO (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 4–6, pp. 41, 42*).—A preliminary experiment in the use of carbon dioxid as a substitute for ground cork in the conservation of commercial table grapes indicates that the grapes will keep for a much longer time when packed in ground cork, since the carbon dioxid tends to hasten the ripening processes.

Storage test of shipping grapes, F. DE CASTELLA (*Jour. Dept. Agr. Victoria, 10 (1912), No. 12, pp. 715–717*).—In continuation of experiments previously reported (E. S. R., 25, p. 841) notes are given on several varieties of table grapes which were packed in granulated cork and placed in cold storage for a period of nearly 4 months at Melbourne. A number of varieties were found to have kept in good marketable condition during this time.

The avocado, L. MARTÍNEZ (*Estac. Agr. Expt. San Juan Bautista, Tabasco, Bol. 8, 1911, pp. 16, pls. 8*).—A study of the avocado relative to its history, classification, botany, varieties, culture, and uses.

Pineapple culture, P. J. WESTER (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 10, pp. 530–543, figs. 2*).—A popular treatise on pineapple culture with special reference to Philippine conditions.

The Italian lemon industry, G. H. POWELL and F. O. WALLSCHLAEGER (*Citrus Protect. League Cal. Bul. 10, 1913, pp. 58*).—This comprises a detailed financial survey of the Italian lemon industry, conducted under the direction of the Citrus Protective League of California. Cost data are given which cover practically every phase of the production, handling, and marketing of Italian lemons, special attention being given to the importation and distribution of these lemons in the United States.

Coffee: Production, trade, and consumption by countries. H. C. GRAHAM (*U. S. Dept. Agr., Bur. Statis. Bul. 79, pp. 134, figs. 4*).—This comprises a detailed statistical history of the development of the coffee-growing industry in all producing countries. Introductory considerations deal with the history, origin, and cultivation of coffee. Tabular data are then given showing the coffee production and trade of various countries for a period of years, the per capita consumption, by countries, in 1909 with more detailed data on consumption in the United States and the United Kingdom; prices on the New York market by grades; tariff rates in various countries; tariff rates in the United States from 1789 to 1911; and substitutes and adulterants.

A bibliography of consulted literature is appended.

How to grow asters. G. ARNOLD (*Rochester, N. Y., 1912, 6. ed., rev., pp. 40, figs. 13*).—A concise manual on asters, discussing classification, commercial culture, and protection from insect enemies and diseases.

Mendelian inheritance in the carnation. W. STUART (*Vermont Sta. Bul. 163, pp. 51–72, pls. 8*).—In order further to substantiate or disprove Norton's theory, which is essentially that a greater proportion of true commercial or semidouble carnations can be produced by crossing the single and extreme double types rather than by always selecting both parents from the standard commercial type (E. S. R., 16, p. 731; 18, p. 697), the author carried on hybridization studies at the Vermont Station during the winters 1907–8 and 1908–9, and at the U. S. Department of Agriculture, Arlington Farm, in 1910–11.

During the course of the investigation the following crosses were studied with reference to their effect on the resultant progeny: Single x single, commercial x single, single x double, commercial x commercial, and double x double, the first parent in each case representing the seed parent. Conditions were so unfavorable in 1908–9 that the considerable amount of data secured during that period has been ignored. The results secured during the other 2 periods are here tabulated and discussed in detail. Consideration is also given to the relative structure of commercial or semidouble versus double flowers and to the nature of doubling in the carnation. By way of introduction a brief interpretation is given of Mendel's law and some previous observations on inheritance are noted.

Taking the results of the investigation as a whole, Norton's theory that the commercial carnation is a heterozygote or unfixed hybrid of the single x double carnation is confirmed. The single is recessive to the double. The progeny of the single x double, of which there were 1,004, were all of the commercial type except 4, which were single and may possibly be ascribed to error in technique. Singles x singles produced only singles; commercials x singles gave practically an equal number of each; commercials x commercials gave very nearly the expected ratio of singles according to Mendel's law.

In addition to producing flowers almost entirely of the commercial type, the crosses between single and double carnations were more prolific than the other crosses, a fact of importance in carnation breeding.

A study of the floral structure of the carnation leads the author to suggest that "bursting," a trouble which commonly occurs in some commercial varieties, may be largely due to the formation of adventitious buds in the flower rather than to inherent weakness of the calyx, or to unfavorable temperatures shortly before the flowers open, the cause of the "bursting" occurring at a much earlier stage in the development of the flower. Carnation doubling appears to be due to a variety of morphological modifications of the floral organs.

Perpetual carnations. L. J. COOK (*London, New York, Toronto, and Melbourne, 1912, pp. 101, pls. 16, fig. 1*).—This comprises a practical guide to the

outdoor and indoor culture of perpetual carnations, with special reference to English conditions.

The origin of an early variety of Matthiola by mutation, H. B. FROST (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1911), pp. 536–545*).—This comprises a discussion of mutant forms resulting from the author's cultures of 10-weeks stock.

The oil content of Hungarian perfume roses, K. IRK (*Kisérlet. Közlem., 15 (1912), No. 5, pp. 837–846*).—The percentage of oil yielded by a few of the more important perfume roses in the 3 years, 1910 to 1912, is given.

Native and naturalized plants of Missouri suitable for ornamental planting, L. P. JENSEN (*Missouri Bd. Hort. Spec. Bul. 56 [1913], pp. 71, pls. 6, figs. 41*).—This paper contains a list of planting material which is to be found growing without cultivation in and about the city of St. Louis, Mo. The plants are classified as large trees, medium and small trees, shrubs, vines and climbers, herbs, and ferns. Information is given relative to their distinguishing characteristics and requirements as to soil and moisture.

FORESTRY.

[Timber] (*Proc. Internat. Assoc. Testing Materials, 2 (1911), No. 3, pp. 124–126, 194, 195*).—A bibliography of the periodical literature for 1908 and 1909, relating to timber tests, preservation, utilization, etc.

[Timber] (*Proc. Internat. Assoc. Testing Materials, 2 (1912), No. 6, pp. 354–357*).—A bibliography for 1910 similar to the above.

Second annual report of the state forester to the governor, 1912, F. A. ELLIOTT (*Ann. Rpt. State Forester Oreg., 2 (1912), pp. 85, pl. 1, figs. 9*).—This report includes a discussion of the forest resources and lumber industry of Oregon, fire losses and methods employed in protecting the forests, reconnoissance survey work, experimental planting operations, a financial statement for the year, and the text of the Oregon forest fire law, together with recommendations dealing with forest protection.

Report of the forestry department for the year ended June 30, 1912, R. DALRYMPLE-HAY (*Rpt. Forestry Dept. N. S. Wales, 1912, pp. 17, pls. 7*).—In addition to a progress report of forest operations, including a financial statement, for the year 1911–12, this report includes a review of the workings of the state forestry act with comments on its provisions and the needs of amendment. Three departmental bulletins dealing with the general principles of forestry, afforestation, and reforestation are appended.

Annual report of the director of forestry of the Philippine Islands for the fiscal year ended June 30, 1912, W. F. SHERFESEE (*Ann. Rpt. Dir. Forestry P. I., 1912, pp. 59, pls. 7, fig. 1*).—This includes a progress report of the divisions of investigation and administration. Statements relative to homesteads, sales, leases, revenues, and utilization of forest products, together with a financial statement for the year are appended.

The uses of Philippine woods, E. E. SCHNEIDER and F. W. FOXWORTHY ET AL. (*[Philippine] Bur. Forestry Bul. 11, 1911, pp. 50*).—This comprises compiled lists of Philippine woods arranged in order of suitability for the following special uses: House construction; cabinet-making; furniture; carving, sculpture, etc.; handles; vehicles; bridge and wharf construction (except piles); piling; shipbuilding; mine timbers; paving blocks; poles; and railroad ties. The more important woods are classified according to the durability of their sapwood, and the woods are also described by species with reference to their

structural characteristics, uses, supply, size, and price. Lists of scientific and common names are also included.

Experiments on trees at Colesborne, H. J. ELWES and H. A. PRITCHARD (*Quart. Jour. Forestry, 6 (1912), No. 2, pp. 83–111, pls. 2*).—A progress report on forestry investigations at Colesborne (E. S. R., 25, p. 842).

The climax forest of Isle Royale, Lake Superior, and its development, I, W. S. COOPER (*Bot. Gaz., 55 (1913), No. 1, pp. 1–44, pl. 1, figs. 14*).—This comprises the first contribution to an investigation of the climax forest of Isle Royale, its composition and character, and the various lines of succession leading to it. The particular field of study was selected as showing the transitional features between the eastern deciduous forest and the northeastern conifer forest regions.

The source of seed supply as affecting the quality of Scotch pine (Pinus sylvestris), G. HUFFEL (*Rev. Eaux et Forêts, 51 (1912), Nos. 22, pp. 673–682; 23, pp. 705–715, pl. 1, figs. 2; 24, pp. 737–744, figs. 2*).—A review of various European experiments, in which pine seed obtained from different countries and climatic conditions have been grown side by side, leads the author to conclude that, although the influence of the previous environment of pine seed may be more or less noticeable with young plants, those plants which are successful in adapting themselves to the changed environment are quite apt to develop into trees similar to those produced from native seed.

The collection and extraction of pine seed, BUSSE (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 12, pp. 561–573*).—An account of the author's investigations on this subject.

Some figures concerning the yield of Hevea rubber in Java, P. ARENS (*Meded. Proefstat. Malang, 1912, No. 3, pp. 1–5*).—Yield data are given for a number of tapping experiments conducted during the period 1910 to 1912.

Hemlock in Vermont. Comparative study of log rules, A. F. HAWES (*Vermont Sta. Bul. 161, pp. 3–32, pls. 4, fig. 1*).—In part 1 the author discusses the importance and range of hemlock in Vermont, presents some data showing the average volume in lumber and bark, age, value, and taper for different diameters. A table is given showing the application of a volume table on a typical acre of hemlock and data are also given showing the reproduction of hemlock in a series of hardwood and hemlock stands growing on various sites and exposures. Other phases discussed include the age of hemlock seedlings of different heights, soundness, market conditions, and management.

Part 2 comprises a study of the various log rules in use in Vermont as compared with actual mill tallies.

The circular area caliper, H. TROPPER (*Centbl. Gesam. Forstw., 38 (1912), No. 12, pp. 541–554, figs. 4*).—An exposition on the use of the circular area caliper as compared with the cubing caliper in measuring logs. Sample volume tables are included.

The structure of the timbers of some common genera of coniferous trees, W. S. JONES (*Quart. Jour. Forestry, 6 (1912), No. 2, pp. 112–134, figs. 23*).—The author here enumerates and describes certain features of wood structure by which the timbers of the common conifers may be distinguished from each other.

Ray tracheids in the coniferales, RUTH HOLDEN (*Bot. Gaz., 55 (1913), No. 1, pp. 56–65, pls. 2*).—In this paper the author traces the history of development of ray tracheids in the main groups of conifers, with special reference to the utilization of ray tracheids in the classification of conifers from an anatomical standpoint. A bibliography is appended.

Forest Service investigations of American woods with special reference to investigations of mechanical properties, M. CLINE (*Proc. Internat. Assoc.*

Testing Materials, 2 (1912), No. 13, Paper XXIII$_6$, pp. 17, tables 3, figs. 9).—A paper on this subject presented to the International Association for Testing Materials Congress, New York, 1912. It discusses the general scope and purposes of the investigations and describes the methods of test.

Testing the hardness of wood by means of the ball test, G. JANKA, trans. by C. SALTER (*Proc. Internat. Assoc. Testing Materials, 2 (1912), No. 13, Paper XXIII$_3$, pp. 8, figs. 2*).—In this paper, presented to the International Association for Testing Materials Congress, New York, 1912, the author proposes and discusses the adoption of his ball-test method (E. S. R., 18, p. 341) in the general scheme of tests for wood.

Large versus small test pieces in testing wood, M. RUDELOFF, trans. by E. S. HODGSON (*Proc. Internat. Assoc. Testing Materials, 2 (1912), No. 13, Paper XXIII$_1$, pp. 8*).—A paper on this subject presented to the International Association for Testing Materials Congress, New York, 1912.

The strength, elasticity, and other properties of New South Wales hardwood timbers, W. H. WARREN (*Proc. Internat. Assoc. Testing Materials, 2 (1912), No. 13, Paper XXIII$_5$, pp. 10, pl. 1, figs. 3*).—This paper, presented to the International Association for Testing Materials Congress, New York, 1912, summarizes the scope and method of procedure adopted in the author's investigation of the above subject (E. S. R., 27, p. 43).

Contribution to the study of means for improving the strength of wood for pavements, P. LABORDÈRE and F. ANSTETT, trans. by H. BORNS (*Proc. Internat. Assoc. Testing Materials, 2 (1912), No. 10, Paper XXIII$_4$, pp. 11, fig. 1*).—A paper presented to the International Association for Testing Materials Congress, New York, 1912.

As a result of their experimental studies of means for improving the strength of paving blocks, the authors conclude that the crushing strengths can be considerably improved by heating in a bath of heavy oil tar at a temperature of 130 or 140° C., maintained during a period tentatively fixed at 3 hours. The oil used in the bath should not contain any notable quantities of products that are volatile at 140°. To reduce the diminution in the strengths of paving blocks, due to the absorption of water, about 0.6 per cent of sodium carbonate and 0.1 per cent of sodium silicate may be added to the oil bath, or the blocks may be immersed for about 10 minutes after heating and creosoting under pressure in a bath of liquid pitch at 110°. The laid pavements should then be superficially tarred. The pitch to be used should be half-dry gas pitch including about 10 per cent of anthracene oils.

Report on comparative investigations of wood preservatives (*Meddel. Statsproveanst. [Copenhagen], 1912, No. 19, pp. 27, pl. 1, figs. 20*).—Extensive investigations conducted by the Danish Engineering Society in cooperation with the government during 1904 to 1911 to ascertain the value of different kinds of wood preservatives are reported. Pine, spruce, and oak posts were treated, either by painting, dipping, or by the pressure and vacuum method, with various tar preparations, carbolineum and creosote materials, copper oils, water-soluble substances, oil asphalt, and other kinds of paints, etc. Four posts of each kind of wood were used in the experiments with each preservative, one of which was left untreated for the purpose of control.

The apparent degree of decay at the final examination in 1911 was scored on the scale of 1 to 5, 1 being greatly decayed and 5 apparently sound. The average scores for the untreated posts were: Pine 2.25, spruce 2.79, and oak 2.71. Ten of the preparations gave logs scoring 5 (faultless) for pine, and 22 gave logs scoring 5 for spruce; 9 of this number gave 5 for both kinds of wood. Among the 9 were the creosote preparations and also zinc white with varnish and with

resin oil, lead white with varnish, and sublimate solution (10 days' impregnation at about 15° C.).

Contrary to the results obtained with the pine and spruce, the oak posts were not improved by the use of the preservatives and in several cases appeared to be injured to some extent. Only 8 series of trials were, however, conducted with such posts.

Considerable differences were observed between untreated logs placed in different parts of the field and also between those receiving similar treatments. There seemed to be a certain relation between the rate of decay of the wood and the cellulose-decomposing power of the soil, as determined by Christensen's method (E. S. R., 24, p. 29). The differences observed in the state of preservation of the posts at the close of the experimental period having been obtained under uniform treatment and carefully controlled conditions suggest that considerable further work must be done along this line before the various factors that have a bearing on the case are fully understood.

Some facts about treating railroad ties, W. F. GOLTRA (*Cleveland, Ohio, 1912, pp. 105, pls. 9, figs. 4*).—This comprises a discussion of various methods employed in this country for treating railroad cross-ties, together with a description of improved methods of treating ties and timbers.

DISEASES OF PLANTS.

Economic mycology and some of its problems, E. S. SALMON (*Jour. Southeast Agr. Col. Wye, 1911, No. 20, pp. 434–451, figs. 2*).—This is a presidential address delivered before the British Mycological Society at Taunton, September 20, 1911, and deals with the scientific somewhat more than the economic aspects of economic mycology. Among the questions raised are (1) the economic importance of the specialization of parasitism now known to exist in many fungi; (2) the importance from the economic point of view of the saprophytic stage in the life histories of fungi causing plant diseases; (3) the conditions under which some saprophytic species of fungi become parasites; (4) the conditions under which a parasitic fungus attacks a new host species; (5) methods of combating plant diseases by external treatment, as with sprays, etc., by internal treatment, as with materials absorbed into roots or trunk, and by prevention, as in breeding of resistant varieties; and (6) the education of public opinion as to the economic importance of combating plant diseases.

Report of the department of botany and plant pathology, H. L. BOLLEY (*North Dakota Sta. Rpt. 1911, pt. 1, pp. 23–60*).—This is a report of the work of the author and various assistants and includes studies of soil fungi, especially those associated with certain plant diseases; the distribution of fungi present on the seed coats of various grains; the possibility of weeds carrying fungi pathogenic to wheat; bacterial water analyses; studies on flax diseases, flax cropping, flax breeding, and the use of formaldehyde for the prevention of flax wilt and canker; the brown spot of wheat culms; the internal infection of the embryo of wheat; studies on the pink-colored seed of wheat; the cause of red roots of wheat and oats; disinfection of wheat seed with corrosive sublimate; and an examination of quack grass and other grasses and weeds for parasitic fungi.

Thus far the determinations of the fungi have been generic only, and among those grown in cultures have been species of Macrosporium, Helminthosporium, Alternaria, Colletotrichum, and Fusarium. The results of these studies seem to confirm the author's theory of crop depletion being due rather to soil infestation than to the removal of chemical elements from the soil (E. S. R., 25, p. 650).

Plant diseases in 1911, B. F. LUTMAN (*Vermont Sta. Bul. 162, pp. 35, 36*).—The author reports that due to the high temperature and scanty rainfall during the summer, plant diseases were rare and epidemics of the common diseases due to fungi were almost entirely absent.

An attempt was made to ascertain the percentage of oat smut, and reports obtained from six widely separated regions indicated that the smut was present only to the extent of from 1 to 3 per cent. It is said that farmers depend almost entirely on home-grown seed, and where there is such a small proportion of infestation treating the seed is not believed to be economically profitable.

During the summer a disease of Baldwin and Greening apples appeared and was reported from a number of localities. The affected fruit showed sunken spots over the surface, and these were of a darker hue than the surrounding skin but were never brown. In most cases the spots extended only a short distance below the surface and were of a dry corky nature. The disease is thought to be identical with the spot disease known as "Stippenflecken" in Germany and is different from that occurring on the Baldwin apples in this country. Some specimens were seen in which the corky dry streaks extended from the surface to the core, following in general the vascular system. The disease is believed to be due to physiological disturbances, which are favored by dry weather.

Fungus diseases of cultivated and wild plants in the Government of Tula, Russia, during the summer of 1911, T. P. TRUSOVA (*Zhur. Bolĕzni Rast., 6 (1912), No. 1–2, pp. 1–15; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2095*).—Among 119 different diseases examined by the author in the summer of 1911 may be mentioned the following:

Rust was very prevalent, especially *Puccinia coronifera* on oats. *Ustilago avenæ, U. nuda,* and *Urocystis occulta* injured barley and oats in practically all sections. *Fusarium tritici* showed a degree of infection as high as 45 per cent on Petelino wheat. Buckwheat was found to be attacked by a hitherto undetermined disease found to be due to *Ascochyta fagopyri tulensis. Phyllosticta medicaginis, Uromyces trifolii,* and *Phyllachora trifolii* were reported to attack forage crops severely, while peas were attacked by *Uromyces pisi,* potatoes by *Phytophthora infestans,* Cucurbitaceæ by *Peronospora cubensis,* and cherries by *Clasterosporium amygdalearum.* Other widely spread fungus diseases are mentioned, among which are those due to *Sclerotinia cinerea, Puccinia pringshcimiana, Polystigma ochraceum,* and *Melampsora tremulæ.*

Phytopathological investigations, J. KUIJPER (*Dept. Landb. Suriname Verslag, 1911, pp. 16–22*).—Brief notes are given on the occurrence of diseases of bananas, cacao, coffee, Hevea, and sugar cane. The report concludes with a short list of fungi that have been determined during the year.

The genus Septoria, H. DIEDICKE (*Ann. Mycol., 10 (1912), No. 5, pp. 478–487*).—In conclusion of his study of this genus the author presents a summary of his investigations, showing the identity of many species, their synonyms, etc. As a result of his study, he limits the genus Septoria and refers to Cylindrosporium some of the species hitherto referred to Septoria.

A new species of Pestalozzia, G. BAINIER and A. SARTORY (*Ann. Mycol., 10 (1912), No. 5, pp. 433–436, pl. 1*).—A technical description is given of *P. capiomonti* n. sp., a species that developed spontaneously on moist grass kept in the laboratory.

The relation of parasitic fungi to the contents of the cells of the host plants. II, The toxicity of vegetable acids and the oxidizing enzym, M. T. COOK and J. J. TAUBENHAUS (*Delaware Sta. Bul. 97, pp. 53, pl. 1*).—This bulle-

tin gives an account of work carried on in continuation of previous studies (E. S. R., 25, p. 524). In the previous publication the authors reported upon the toxicity of tannin, while in the present bulletin studies on the toxicity of other vegetable acids and on the function and importance of the oxidizing enzym are discussed. The effect of tannic, gallic, tartaric, malic, and citric acids on 9 different species of fungi was determined, together with the effect of asparagin and amygdalin on the same organisms. In connection with this study the possible identity of a number of species of Glœosporium is reported upon, a previous account having been noted elsewhere (see below).

The authors found that the toxicity of vegetable acids varies with the organisms used, but that tannic acid is the most toxic. Organisms from fresh cultures are more resistant to acids than those from old cultures. Vegetable juices were found to contain an enzym which acts upon gallic acid, forming a tannin or tannin-like body which is toxic to fungi. The enzym decreases with the maturity and ripening of the fruit, while the power of resisting the parasitic organisms is decreased proportionately. Fruits of many plants were found to lose their power of resistance very soon after removal from the plant, and this is believed to be in proportion to the reduced activity of the enzym. Kieffer pears were more resistant to the organisms used than apples, and non cultivated crab apples than cultivated ones.

Chemical tests of apples and pears made throughout the season indicated a decrease in the oxidizing power of the enzym, a slight increase in acids, and a pronounced increase in sugars. The amount of acid in a fruit, as indicated by chemical analyses, may be greater than the quantity necessary to check or prohibit the growth of a parasite in culture. Chemical tests of fresh and decayed persimmons showed that the greatest difference was due to the oxidizing power of the enzym. Green fruits were very resistant to disease, while the rotten ones were very susceptible. The changes during the process of ripening in this fruit were the same as those reported for apples and pears, except that there was a slight decrease in acidity in the persimmons.

A further study of some Glœosporiums and their relation to a sweet pea disease, J. J. TAUBENHAUS (*Phytopathology, 2 (1912), No. 4, pp. 153–160, pl. 1, fig. 1*).—A detailed report is given of experiments which are held to support the conclusion previously noted (E. S. R., 26, p. 751) that the anthracnose disease of the sweet pea is due to the same organism as that causing the bitter rot of the apple. The investigations show that the sweet pea disease is caused by *Glomerella rufomaculans*. *Glœosporium gallarum*, *G. diospyri*, *G. officinale*, *Glœosporium* sp. from May apple fruit, *Colletotrichum nigrum*, and *C. phomoides* are believed to be identical with *G. rufomaculans*, since they can produce the typical bitter rot of the apple on the tree and the anthracnose of the sweet pea. *Glomerella gossypii* is believed to believed to be a physiological species of *G. rufomaculans*, since it readily infects the sweet pea. It does not infect the apple unless the fruit is mature on the tree or is picked from the tree and brought in doors. *C. glœosporioides*, *Glœosporium* sp. from *Populus deltoides*, *G. musarum*, and *C. lagenarium* appear to be distinct species. The author believes that the great number of species of Glœosporium and Colletotrichum that have been described would be reduced if they were tested by cross inoculation.

Infection with *G. rufomaculans* on the sweet pea is effected when the germ tube of the spore breaks through the epidermal cells of the tender leaves or stems. The period of incubation on the sweet pea ranges from 3 to 5 days according to the amount of moisture in the atmosphere.

The influence of boric acid and some other compounds on the development of Penicillium glaucum and Aspergillus niger, J. BÖSEKEN and H. I. WATER-

MANN (*Folia Microbiol. [Delft], 1 (1912), No. 3, pp. 17; abs. in Mycol. Centbl., 1 (1912), No. 10, pp. 322, 323*).—The authors report the result of a large number of experiments made on the limiting influence of certain compounds on the development of 2 fungi.

The limiting influence of boric acid on *P. glaucum* was found to depend in part upon the nature of the nutritive medium and also upon the degree of utilization of carbon. At 21° C. pure cultures of *P. glaucum* grown from conidia were clearly depressed by 0.06 per cent boric acid, while under like conditions from 0.5 to 1 per cent of the same acid was required to check the development of *A. niger*. Tabulated results of numerous experiments with various compounds on these fungi in different nutritive media are given. According to the authors, the deleterious effect of boric acid and the other compounds is perhaps attributable to selective chemical combination.

Stalk disease of cereals, E. VOGES (*Deut. Landw. Presse, 39 (1912), Nos. 71, pp. 815, 816, figs. 4; 72, pp. 823, 824, figs. 3*).—The author, summing up the evidence from investigations by himself and others, concludes that of the various fungi (particularly *Ophiobolus herpotrichus* and *Hendersonia herpotrichoides*) found in connection with stalk or foot disease of grains none is the primary cause of the observed condition; but that lowering of vitality in the plant, due to cold or drought, may favor the development of the parasites which are thus both the result and cause of weakness in the stems. Selection of seed from resistant stocks and management of the crop so as to secure vigor in the plants are the only remedies proposed.

Smuts of Nebraska cereals, E. M. WILCOX (*Nebraska Sta. Bul. 131, pp. 3–16, figs. 13*).—This bulletin is designed to furnish information regarding the life history and proper methods of control and prevention of the common smuts of Nebraska cereal plants. After giving an account of the life history of the smuts in general, the author takes up the loose smuts of barley and wheat, stinking smut of wheat, covered smut of barley, loose smut of oats, grain and head smuts of sorghum, and corn smut, describing them and suggesting methods of seed treatment for their prevention. No method of seed treatment is believed to be of value in controlling corn smut.

Experiments with hot water and air in combating loose smut of barley and wheat, R. SCHANDER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 5, pp. 416–492, figs. 7*).—Pursuant to previous work (E. S. R., 24, p. 346), the author gives an extended account of the methods employed and in numerous tables the results obtained in experiments with smut on several varieties of barley and wheat.

Treatment with either hot water or hot air is recommended, the author apparently preferring the former. This includes first a soaking at from 25 to 30° C. for several hours and, after an interval, a bath of 10 minutes in water at from 50 to 52° for barley or from 52 to 53° for wheat, and planting as soon thereafter as is practicable. Modifications of this treatment also give good results. The hot air treatment is similar in its effect to that with water, but employs higher temperatures during longer periods. Further experiments are to be reported later.

The branching of rice: Studies and observations, N. NOVELLI (*Gior. Risicult., 2 (1912), No. 13, pp. 193–201, figs. 4; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2090, 2091*).—The appearance of axillary shoots on rice of several varieties, showing on about 10 per cent of the plants and maturing no grain but acting as suckers on the plant, was investigated by the author, who ascribes the abnormal growths to the irregular function of assimilation, enfeeblement of vegetative development, and

excessive height of water in the field during sprouting. As preventive measures, he recommends the avoidance of unnecessarily late manuring, especially with nitrogenous materials, of late weeding, and of too high water during sprouting.

The history of beet nematodes, A. STIFT (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 3, pp. 417–498*).—This is a historical review of published investigations on *Heterodera schachtii* extending from May, 1859, to April, 1912.

Occurrence of gummosis in sets and transplanted tobacco, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 2, pp. 65–69*).—Continuing previous studies on slime bacteria in seed beds (E. S. R., 28, p. 243), the author found that in nearly every one of 12 series of experimental plantings approximately the same degree of infection was found in the older plants as had appeared in case of the sets while on the seed beds.

The alleged immunity of Nicotiana rustica to gummosis, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 3, pp. 95–98*).—The author's tests on *N. rustica* in both pot and field experiments by inoculating 100 plants with *Bacillus solanacearum* developed gummosis in all but one plant, while of the controls only one showed infection.

A test of the Hegyi treatment with tobacco seed, J. A. HONING (*Meded. Deli-Proefstat. Medan, 7 (1912), No. 2, pp. 70, 71*).—The author found the drying treatment of seeds, recommended by D. Hegyi for beets (E. S. R., 26, pp. 548, 747), to be without beneficial effect when tested with 4 lots of tobacco seeds as a protection against Phytophthora. The conclusion is drawn that either the beneficial effect of the drying treatment is greatly overrated or else that structural or other differences in seeds render it practically ineffective in case of tobacco seeds.

A new fungus disease of the yam, S. ITO (*Trans. Sapporo Nat. Hist. Soc., 4 (1912), No. 1, pp. 8–12*).—The author describes a disease of vines and leaves of the cultivated yam (*Dioscorea batatas*), due to *Cylindrosporium dioscoreæ* n. sp.

The treatment of lettuce rot and spinach mildew, N. SCHNEIDER (*Rev. Hort. [Paris], 84 (1912), No. 21, pp. 493, 494*).—The author recommends covering the ground with a light dressing of powdered charcoal for the prevention of the rots of lettuce due to *Bremia lactucæ* or *Peronospora gangliiformis* when it is desired to grow varieties of lettuce under glass. Care must be taken with watering and cultivating the plants and in airing the house. A light application of sulphur is also advised, to be applied toward the end of November or early in December.

For the mildew of spinach (*P. effusa*) and attacks of *Heterosporium variabile* the use of sulphur well distributed over the plants is advised. Thorough washing of the leaves will, it is said, remove the sulphur, so that the plants will not be objectionable from a culinary standpoint.

Canker on some native trees, R. PROBST (*Umschau, 16 (1912), No. 44, pp. 930–932, figs. 6*).—This is a brief discussion of cankerous growths observed on beech, birch, or apple trees and said to be due to *Nectria ditissima*, the spores of which are thought to be carried by wind, rain, insects, birds, etc., to uninfected trees. Insect and other enemies are also said to play a part in the formation of the wound, and droughty and poor soils to favor these conditions. Cutting out the parts affected and covering the wound with coal tar is advocated as an efficient remedy.

The nature and infectiousness of crown gall, C. O. SMITH (*Pacific Rural Press, 84 (1912), No. 22, pp. 526, 527*).—An account is given of the nature and cause of crown gall, which is attributed to *Bacterium tumefaciens*, and the results of a number of experiments and inquiries of the author are included.

It is said that the organism causing this disease is present in many California soils and often causes large losses among nursery stock, being particularly severe on seedlings of the various stone fruits. New land that has never grown fruit trees or nursery stock was often found to give a large percentage of galled seedlings, and the disease is apparently worse on light sandy or gravelly soils than on heavy ones. Irrigation seems to increase materially the amount of gall infection, as the experiments showed a greater proportion of infected seedlings on irrigated than on higher ground.

Inoculation work thus far carried on seems to indicate differences in susceptibility of certain species, and it is intended to carry on further experimental work with a view to determining what species or varieties of Prunus are resistant and adapted as root stock for the different stone fruits.

Further proof of the cause and infectiousness of crown gall, C. O. SMITH (*California Sta. Bul. 235, pp. 531–557, figs. 28*).—This bulletin gives an account of artificial inoculation experiments carried on to determine the different host plants for the crown gall organism, *Bacterium tumefaciens*. Nearly all of the inoculations reported were made from pure cultures isolated from peach root knots. The organisms were introduced by means of sterile needles, no attempt being made to produce the disease by applying the germs to the uninjured surface of the plants.

The following trees were successfully infected: Several varieties of peach; *Prunus davidiana;* bitter and hard-shell almond; apricot; Myrobolan, Marianna, and Wickson plum; Mazzard and Mahaleb cherries; English walnut; Japanese, eastern, and California black walnuts; pecan; French pear stock; Bartlett and Chinese wild pear; apple; Angiers quince; sour and sweet (Valencia) citrus stock; sweet limes and lemons; fig; Muscat grapes; eucalyptus; Victoria bottle tree; flame tree; oleander; pepper tree; and *P. integrifolia* (Catalina cherry). Puncture inoculations have given negative results with loquat, *Grevillea robusta* (silk oak), German prune, *P. ilicifolia* (wild hill cherry), *Anona cherimolia*, avocado, and olive.

The author states that characteristic aerial galls occur on different kinds of trees in California, having been observed on quince, olive, lemon, sweet orange, oleander, and grape. The cause of the galls on the olive and grape have been determined, while the remainder are being studied but are not yet definitely understood.

Chlorosis of fruit trees, P. HOC (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 36, pp. 312, 313*).—The author describes a method of treatment of pear and other fruit trees subject to chlorosis, which consists of planing through the bark on the side of the tree toward the sun at a time when there is the greatest activity of the sap. This is followed by an unusual effort on the part of the tree to heal the wound, causing a greater draft on the soil nutrients, and in nearly every instance tested it resulted in the foliage regaining its usual vigorous green color. In addition to this treatment it is recommended that the trees be watered with a 15 per cent solution of sulphate of iron. By the application of both methods the author states that his fruit trees, some of which were badly affected, have been restored.

Observations on powdery mildew of apples, A. MANARESI (*Staz. Sper. Agr. Ital., 45 (1912), No. 5–6, pp. 376–380; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2097, 2098*).—The author gives data obtained from an examination of apple leaves and flowers affected with *Oïdium farinosum*, claimed to be the conidia-bearing form of *Podosphæra leucotricha*.

The mycelium is said to hibernate in the leaf and flower buds, developing in early spring and giving a characteristic whitish-gray appearance to the shoots.

The leaves attacked grow abnormally, being thicker but shorter and particularly narrower than healthy leaves, and they usually dry up in summer. Flowers attacked, even if they open, produce no fruit and they show, in general, somewhat the same deformities that characterize the leaves. It is said that this parasite occasions serious damage only under certain specified and not very frequent conditions of climate, variety of host plants, and soil.

On the use of the lime-sulphur wash against apple scab, E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 408–418*).—The author reports that in experiments made at six centers with home-boiled lime-sulphur wash for control of apple scab, the main object, that of testing the efficiency of the fungicide, was in large part defeated by weather unfavorable to development of the disease, but that the series of experiments showed at what concentration this mixture is safe to use. Lists are given of varieties with which it is safe to use the full strength here employed (specific gravity 1.01), half strength, or one-fourth strength, the last mentioned being the lowest concentration found to be protective. While lime-sulphur wash is thought likely, when fully adapted, to prove a valuable summer spray in some cases, it is in general considered inferior as a fungicide to Bordeaux mixture, which still holds first place for general use against scab on apples and pears.

Investigations of mildew in 1912, G. BARBUT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), Nos. 44, pp. 551, 552; 45, pp. 595–599; 46, pp. 614–623*).—The author gives an account of investigations conducted by the experiment station at Carcassonne, especially of those connected with a study of the downy mildew (*Plasmopara viticola*) and the factors concerned with the appearance of the disease, means adopted for its control, etc. Particular attention was paid to the relation between meteorological conditions and periods of invasion by the fungus. Eight distinct invasions are reported between April 25 and July 14, with periods of incubation varying from 4 to 11 days. The longer period of incubation seemed to be a result of the simultaneous occurrence of a rather low average temperature, considerable humidity, and high winds. This and the succeeding invasion on June 12, were the most severe of the season.

The principal conclusions drawn from the investigations are as follows:

Fungicides containing 2 per cent sulphate of copper were entirely efficient in controlling the disease if properly applied and at such times as would result in the presence of the fungicide when the spores were being scattered by the wind. Treatments made after infection were without any effect. The greatest infestation of the mildew seemed to follow periods of heavy rain with a low minimum temperature, and were associated with strong winds which retained for some time a definite direction. Dews and fogs did not seem to influence materially the amount of disease. In 1912 the average period for which fungicides retained their efficiency was from 10 to 12 days, and no advantage was found to follow the application of fungicides to the lower portion of the leaves. Spraying with knapsack pumps, where the pressure could be regulated by the individual, gave better results than purely mechanical pressure. Late pruning, the presence of certain other diseases, too vigorous stock, and fertilizing with heavy applications of nitrogenous manures, all tended to aggravate the disease.

In treating vines for mildew the author states that powdered forms of fungicides are valuable adjuncts for the control of gray and brown rot, but that used alone the powdered fungicides are not efficient.

The American gooseberry wildew, R. S. VINSON (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 427–433*).—This is an account of *Sphærotheca mors-uvæ* observed in Kent County, England, in 1911.

The mildew first appeared on May 16, attacking the fruit and spreading rapidly owing to weather conditions, but it was in a degree checked later by

continuously hot and dry weather before it had affected many of the shoots. The report shows that where spraying and pruning have been properly employed the diseased area has generally been lessened. It is thought that late pruning permits the ground to become infected by the winter spores, in large part neutralizing the effect of the work.

Spraying experiments with lime-sulphur wash on gooseberries, D. E. BAXTER and E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 419–426*).—The object of these experiments was to ascertain at what strength lime-sulphur wash can be used on the foliage of the gooseberry from May to September without causing injury as regards leaf fall, the spraying being done at intervals of approximately 2 weeks.

The results obtained from different varieties indicate that (1) some varieties, as Whinham Industry, can be safely sprayed under most weather conditions with the lime-sulphur wash of specific gravity 1.01 and under any weather conditions with this wash at half this strength; (2) it is unsafe to spray other varieties, as Berry Early, with the mixture at half strength or even lower if the weather is hot or becomes so soon after spraying, as serious defoliation results; while (3) with the last mentioned variety in dull warm weather and in sunny weather, if not very hot, this fungicide may be used at half strength with very slight resulting defoliation.

Bacteriosis of Matthiola annua, G. BRIOSI and L. PAVARINO (*Separate from Atti Ist. Bot. Univ. Pavia, 2. ser., 15 (1912), pp. 7, pls. 2*).—Continuing the main portion of this report, previously noted from another source (E. S. R., 27, p. 851), the authors add that Bordeaux mixture was found ineffective. They recommend such preventive measures as early destruction of all infected plants by fire; rotation with nonsusceptible plants; careful selection of plants for seeding purposes; treatment of seeds for 15 or 20 minutes with 0.1 per cent solution of corrosive sublimate or 0.5 per cent formalin; and careful adaptation of manures with a view to increasing the vigor and resistance of the plants.

The perfect stage of Actinonema rosæ, F. A. WOLF (*Bot. Gaz., 54 (1912), No. 3, pp. 218–234, pl. 1*).—In continuation of a preliminary report (E. S. R., 26, p. 650), a detailed account is given of the author's investigations which led to the discovery of the perfect stage of the fungus causing the black spot on rose leaves. Attention is called to the varying susceptibility of different varieties of roses, and, as the perfect form of the fungus winters over in the fallen leaves, it is suggested that all leaves should be gathered and burned, either late in the autumn or early in the spring.

A new Gnomonia on hickory leaves, F. A. WOLF (*Ann. Mycol., 10 (1912), No. 5, pp. 488–491, pl. 1*).—The author states that the leaves of the shagbark hickory (*Carya ovata*) in the vicinity of Auburn, Ala., often carry the imperfect fungus *Glœosporium caryæ*. Affected leaves were collected during the autumn and placed in cages to winter out of doors, and on May 4 mature perithecia were found. The fungus was cultured from both the conidial and the ascosporic stages and inoculation experiments were made with the two forms which showed the relationship of the Glœosporium stage and the Gnomonia stage.

The fungus, to which the name *Gnomonia caryæ* n. sp. is given, is technically described.

A new disease of Calotropis in East Africa, H. MORSTATT (*Ann. Mycol., 10 (1912), No. 5, p. 451*).—A description is given of *Napicladium calotropidis* n. sp., which was found parasitic upon leaves of *C. procera*.

Plant protection, C. A. MCCUE (*Delaware Sta. Bul. 98, pp. 78, figs. 9*).—In this bulletin the author gives the principal formulas for fungicides and in-

secticides, together with a discussion of their preparation and application. The more common diseases, rodent pests, and insects of the different orchard, field, and garden crops are described, and so far as known definite methods suggested for their control. A discussion of spraying machinery is included.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Regulation for the protection of deer in Alaska (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 86, p. 1*).—The regulation here promulgated prohibits the killing of deer on Kodiak Island and Long Island, Alaska, until December 10, 1914.

[The common ground squirrels and their control in California] (*California Sta. Circ. 82, pp. 4, figs. 2*).—The common ground squirrels of California are briefly considered by H. C. Bryant (pp. 1, 2), and the control of ground squirrels by H. J. Quayle (pp. 3, 4.).

[Animal pests, etc., in Colorado] (*Off. State Ent. Colo. Circ. 1, 1910, pp. 15, figs. 12; 1912, Circs. 2, pp. 16, figs. 10; 3, pp. 10, figs. 5; 4, pp. 2; 5, pp. 44, figs. 15; 6, pp. 20, figs. 9*).—These circulars relate to the following subjects: (1) Colorado's Horticultural Inspection Law and Methods for the Control of Insect Pests and Plant Diseases, by C. P. Gillette; (2) The Pest Inspection Act, by C. P. Gillette, Prairie Dogs and Methods of Control, by S. A. Johnson, and The Wyoming Spermophile or Picket-Pin Gopher (*Citellus elegans*), by W. L. Burnett; (3) Loss from Foul Brood and Poor Management, by W. Foster; (4) Suggestions for Combating Prairie Dogs and Ground Squirrels, by W. L. Burnett; (5) The Fruit-Tree Leaf Roller (*Archips argyrospila*) in Colorado, by C. P. Gillette and G. P. Weldon; and (6) Report on Rodent Investigations for 1912, by W. L. Burnett.

Index to papers relating to the food of birds by members of the Biological Survey in publications of the United States Department of Agriculture, 1885–1911, W. L. McAtee (*U. S. Dept. Agr., Bur. Biol. Survey Bul. 43, pp. 69*).—The object of this bulletin is to furnish an index to papers, some 131 in number, by members of the Bureau of Biological Survey, in the various publications of this Department, up to and including December, 1911, which contain information on the economic status of birds as determined by their food habits.

A brief introduction is followed by an annotated bibliography of papers relating to the food of birds (pp. 8–31) and the index proper (pp. 32–69). The papers indexed contain more or less extended accounts of 401 species of native birds and 59 foreign or introduced species.

The food of nestling birds, W. E. Collinge (*Jour. Bd. Agr. [London], 19 (1912), No. 6, pp. 460–465*).—The author reports upon the nature and amount of food consumed by the starling (*Sturnus vulgaris*) during 146 visits of the parent bird to the nest and by the house sparrow (*Passer domesticus*) during the course of 84 visits. He also reports upon the results of examinations of large quantities of feces of young starlings and of the stomach contents of 94 starlings, 42 sparrows, 20 thrushes, and 23 blackbirds.

The food of the bullfinch (Pyrrhula europæa), W. E. Collinge (*Jour. Econ. Biol., 7 (1912), No. 2, pp. 50–57*).—The author reports upon examinations of 484 specimens of bullfinch which were collected during the different months of the year.

The records show that for half of the year the bullfinch is most destructive in fruit orchards, causing considerable losses to growers which far outweigh any little good it may do in keeping down the spread of weeds. Its net value even

in this respect is extremely doubtful since it helps in the distribution of such weeds as the dandelion, dock, groundsel, ragwort, charlock, etc.

Earthworms and their allies, F. E. BEDDARD (*Cambridge, Eng., and New York, 1912, pp. VI+150, figs. 13*).—This work deals with the structure and classification of earthworms, mode of life, external features and their relation to habit and environment, sense organs and senses, relative frequency in different regions of the world, peregrine forms, the earthworms of oceanic islands, movement and migration among earthworms, and the geographical distribution of earthworms.

A list of a few of the larger works relating to this group is appended.

Economic entomology, F. SILVESTRI, edited by G. GRANDI (*Dispense di Entomologia Agraria. Portici, 1911, spec. pt., pp. 575, figs. 474*).—A general work on economic entomology, particularly as applied to Italy.

The enemies of asparagus, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1912, No. 3, pp. 9, 10; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, p. 1896*).—The author lists some 14 insect enemies of asparagus.

The enemies of chrysanthemums, P. NOEL (*Bul. Lab. Régional Ent. Agr. [Rouen], 1912, No. 3, pp. 6–8; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1896, 1897*).—A list is given of 43 insect enemies of chrysanthemums.

The principal cactus insects of the United States, W. D. HUNTER, F. C. PRATT, and J. D. MITCHELL (*U. S. Dept. Agr., Bur. Ent. Bul. 113, pp. 71, pls. 7, figs. 8*).—This bulletin is based largely upon investigations conducted since 1907 by the division of southern field crop insect investigations, having been taken up because of the value of Opuntia as a food for stock. As a result of this work and that of the previous investigators, 324 species of insects are known to be associated with the cactus plant, which the authors divide into 5 categories, as follows: Species injuring the plant, 92; parasites of injurious species, 28; scavengers, 73; flower visitors, 40; species only incidentally associated with the plant, 91.

"The injurious species affect different parts of the plant. In fact, no important part of the plant is immune from injury. Twelve species are known to attack the roots or stem. Twenty-seven species attack the joints, of which 11 species feed inside of the joints while 16 destroy the outer portion. A considerable number are found in the blooms; a few of these are injurious, but others undoubtedly assist in the fertilization of the plant. The fruit is injured by 13 species."

The following are said to be the most important species: Attacking the roots or stems, *Moneilema crassum;* attacking the joints externally, *Chelinidea vittigera, C. tabulata, Chelinidea* sp., *Mimorista flavidissimalis, Disonycha varicornis, Stylopidea picta*, the cottony cochineal insect (*Dactylopius confusus*), etc.; attacking the joints internally, *Melitara junctolineella, M. dentata, M. fernaldialis, Gerstaeckeria porosa, G. nobilis, G. clathrata*, and *Marmara opuntiella;* injuring the blooms, *Trichochrous* (*Pristoscelis*) *texanus;* injuring the fruit, *Narnia pallidicornis, Asphondylia opuntiæ, Cornifrons clautalis, Allorhina mutabilis, Sixconotus lutcicops, Polistes* spp., *Liotropis contaminatus, Dytopasta yumaella, Ozamia lucidalis*, and *Platynota rostrana;* and scavengers, *Copestylum marginatum, Hermetia* spp., and *Stictomyia longicornis*. The biology of a large number of these insects is reported upon.

A list of the principal cactus insects of the United States, grouped by orders, under the headings of species which injure the plant, parasites or enemies of the injurious species, scavengers, species which merely frequent the flowers,

and species incidentally associated with the plant, which follows, gives records of collection, the parts attacked, etc.

A bibliography of 53 titles is appended.

A contribution to the knowledge of the phytopathologic importance of grain thrips, F. STRAŇÁK (*Deut. Landw. Presse, 39 (1912), No. 67, p. 771, figs. 6*).—This article is based upon personal observations and experiments and information received from numerous farmers.

It is stated that during the season of 1912 grain crops were injured by thrips to an unusual extent in many districts of Bohemia. Rye was found to be most seriously affected, from 25 to 100 per cent being attacked; followed by wheat, which varied from 5 to 70 per cent; barley, which varied from 5 to 40 per cent; and oats, which varied from 2 to 20 per cent. In grain in the vicinity of Marsovic as high as 88 per cent of the spikes was found to be injured. An average of 29 per cent of the spikelets were wanting, and the remainder of the injured spikelets averaged but one-half the value of sound spikelets, partly because of their being upper spikelets and partly because the attack of the thrips had prevented the development of sound grain, often resulting in their being completely empty. The author's investigations show that spikes attacked by thrips break more readily and that there is quite likely to be a loss in this way.

Anthothrips aculeata was found to be the most abundant species on rye, followed by *Limothrips denticornis* and *Aptinothrips rufa; Stenothrips graminum* was present in greatest numbers on wheat, followed by *Anthothrips aculeata* and *L. denticornis; L. denticornis* was most abundant on barley, followed by *Aeolothrips fasciata* and *S. graminum*, and less numbers of *Bolacothrips* and *Dictyothrips betæ*.

A rotation of the grain crop with leguminous, hoed, or other crops is said to reduce the injury greatly. The time of seeding was found to be an important factor in dealing with the pest, rye sowed in late September being much less injured than that sowed earlier. Increasing the vigor of the plant through the application of fertilizer is also said to lessen greatly the injury caused.

Aphididæ of southern California, X, E. O. ESSIG (*Pomona Col. Jour. Ent., 4 (1912), No. 3, pp. 758–797, figs. 10*).—This is in continuation of the paper previously noted (E. S. R., 27, p. 859).

On the life history and habits of Orthezia urticæ, R. KIRCHNER (*Jahresh. Ver. Vaterländ. Naturk. Württemb., 68 (1912), pp. 1–17, figs. 17*).—Morphological and biological studies of this species are reported.

Two efficacious methods of controlling the West Indian peach scale and other insects, E. POLLACCI (*R. Ist. Lombardo Sci. e Lct. Rend., 2. ser., 45 (1912), No. 7, pp. 336–342; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1688, 1689*).—The author recommends the application during the winter months of the following formulas: (1) Well-preserved chlorid of lime 12 lbs., water 10 gal., and powdered permanganate of potash 0.2 lb.; and (2) milk of lime 100 gal., caustic soda 2 lbs., and powdered permanganate of potash 1 lb.

The "Longulus" scale, D. KELL (*Pomona Col. Jour. Ent., 4 (1912), No. 3, pp. 798–800*).—This scale is said to have been known in groves in the Claremont and Pomona districts of California for some 3 or 4 years, during which time it has been steadily on the increase.

Scale insects and their insect parasites, H. A. BALLOU (*West Indian Bul., 12 (1912), No. 4, pp. 448–463*).—This general account includes tabular lists of parasites with their hosts and the food plants thereof, together with brief notes; of parasitic Hymenoptera taken by sweepings with the net at Montserrat; of predaceous Hymenoptera; of parasitic and predaceous Diptera; and of lady beetles and other predaceous beetles. An account is also given of *Zalophothrix*

mirum, the principal insect parasite of the black scale of cotton (*Saissetia nigra*) in the West Indies, which has also been reared from the brown shield scale (*S. hemisphærica*), the oleander scale (*S. oleæ*), and from the barnacle wax scale (*Ceroplastes cirripediformis*), and of the utilization of parasitic and predaceous insects.

The use of entomogenous fungi on scale insects in Barbados, J. R. Bovell (*West Indian Bul., 12 (1912), No. 4, pp. 399–402*).—A brief account is given of the work in Barbados with entomogenous fungi.

Further notes on the fungus parasites of scale insects, F. W. South (*West Indian Bul., 12 (1912), No. 4, pp. 403–412*).—These notes relate largely to the red-headed fungus (*Sphærostilbe coccophila*), the white-headed fungus (*Ophionectria coccicola*), the black fungus (*Myriangium duriæi*), and the shield scale fungus (*Cephalosporium lecanii*). See also a previous note (E. S. R., 24, p. 246).

Remarks upon an apparently new apple pest, Lygus pratensis, W. E. Collinge (*Jour. Econ. Biol., 7 (1912), No. 2, pp. 64, 65*).—The author finds that the tarnished plant bug injures apples in England by depositing its eggs in the fruit before the petals have dropped, as has been previously described by Taylor (E. S. R., 20, p. 1051).

Studies of comparative lepidopterology, C. Oberthür (*Études de Lépidoptérologie Comparée. Rennes, 1912, No. 6, pp. 355, pls. 131*).—This is a continuation of the work previously noted (E. S. R., 26, p. 455).

Pieris monuste, a pest of cultivated crucifers, C. Moreira (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1690, 1691*).—The larva of this butterfly is the source of serious injury to crucifers grown in Brazil.

Papers on deciduous fruit insects and insecticides.—**The grape-berry moth (Polychrosis viteana)**, F. Johnson and A. G. Hammar (*U. S. Dept. Agr., Bur. Ent. Bul 116, pt. 2, pp. 15–71, pls. 5, figs. 19*).—This paper is based upon a series of life history records and field experiments conducted during the seasons from 1907 to 1909, inclusive, in connection with investigations of the grape rootworm and other insect pests of the grapevine carried on at North East, Pa.

The authors first give a brief historical résumé showing the attention this insect has received from earlier entomologists. It is pointed out that for many years it was confused with the European grape-berry moth (*Eudemis botrana*), which is very destructive to the berries of grapes in the vineyards of southern Europe and to which it is closely related and bears a very close resemblance, both in appearance and in the manner in which it attacks the grape. The conclusions of Slingerland (E. S. R., 16, p. 681) that the grape-berry moth feeds and reproduces only in the berries of grapes, wild and cultivated, are borne out by the observations made, the insect in no case having been reared from anything except the blossom clusters and berries.

Since the first reports of serious injury to the grape crop near Hudson, Ohio, in 1869, this pest has been an almost continual menace to grape production in vineyards located along the shores of Lake Erie from Sandusky in Ohio eastward into Pennsylvania and New York. It appears to be confined in its distribution to those eastern and west-central States of the United States and to those eastern Provinces of Canada in which the growth of wild and improved varieties of American species of grapes is of considerable extent.

The moth is largely nocturnal in its activities, since practically all of the eggs were deposited on grape berries in rearing cages during the night.

"The first larvæ to hatch are from eggs which are laid by the earliest emerging moths in spring and are doubtless deposited on the unexpanded blossom buds or on the stems of the blossom clusters. These larvæ attack the blossoms and the tiny berries. In the course of its movements, which must cover the

entire blossom cluster, the larva spins a silken web. This web binds to each other and to the stem the dried corollas, stamens, and partly devoured berries, forming a conspicuous mass. Usually, however, these webs formed during the blossoming period of the grape are not very numerous except in those portions of vineyards where the infestation is very heavy. In addition to attacking the blossoms and small berries of the young grape clusters the larva sometimes burrows into the stem, destroying a part of the cluster. . . . In addition to destroying the berry first attacked, the larva connects it to an adjacent berry by silken strands, forming a tunnel between the partly injured berry and the sound one. This forms an avenue of escape for the larva when the berry first attacked is so badly injured that it breaks away from the stem. When the larvæ of the first brood have attained full growth they leave the web or the partly grown fruit and travel to the leaves upon which they form pupal cases. The larva makes the pupal case by cutting away a portion of the leaf and drawing the free edge down to the surface of the leaf with strands of silk. The inside of the case is lined with the same silken material. In this case the larva transforms to the pupa and the latter emerges as an adult moth. These moths of the first brood deposit their eggs on the now nearly full-grown berries. . . . The larva feeds upon the pulp of the fruit and sometimes attacks the seeds before these commence to harden."

For some time after blooming a larva is capable of destroying several berries or even a large portion of the cluster by attacking the stem, but when berries are attacked after they have attained the size of a pea, rarely more than 2 or 3 are destroyed by a single larva. It is stated that the grape curculio (*Craponius inæqualis*) is the only other insect which injures the fruit in a similar way.

The authors present technical descriptions of the egg, larva, pupa, and adult stages. Studies of the life history next reported in detail are accompanied by tables and diagrams. The authors' studies indicate that there is only one full brood of larvæ and a partial second brood each year in the vineyards of the Lake Erie Valley. The moths from overwintering pupæ commence to emerge about June 1, but less than 25 per cent of these spring-emerging moths appear before the grape is in full bloom. About 4 to 6 days elapse between the emergence of the moths and the deposition of eggs, the egg stage of the first brood covering about 6 days. The larval period covers about 23 days and the pupal stage about 13 days; a small percentage of the pupæ of this first brood pass the winter. Moths of the first brood commence to emerge during the latter part of July, the maximum number emerging about August 10 to September 1. The period of incubation of the second-brood eggs is a little longer than that of the first. The larval stage is also longer, the average being 22 days for the first brood of larvæ as against 40 days for the larvæ of the second brood. The larvæ of the second brood commence to leave the fruit about the middle of September and form pupal cases on the small percentage of grape leaves that have fallen prematurely from the vines.

In connection with the rearing experiments, it was found that a large number of hymenopterous parasites prey upon this insect in its larval and pupal stages, 12 additional ichneumon parasites having been added to the list recorded by Slingerland in 1904. *Dioctes obliteratus* was the parasite reared in greatest numbers.

The remedial measures considered include the destruction of fallen leaves, plowing in late fall or early spring, bagging the clusters, hand picking infested berries, removal of "trimmings," and experiments with poison sprays. Experiments with poison sprays, reported at some length, have led the authors to believe that this method of control will prove to be the most effective and prac-

tical means of control. The combination spray formula recommended for use in combating this pest is Bordeaux mixture, made of lime and copper sulphate, 3 lbs. each, to 50 gal. of water, with 3 lbs. of arsenate of lead.

A bibliography of 69 titles is appended.

Hymenopterous parasites of the nonne moth, B. WAHL (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 6–10, pp. 198–203, figs. 3*).—This is a brief report of observations made in Austria during the past year. *Ichneumon disparis* is said to have been the parasite most frequently met with.

The caterpillar pest of the Mokameh Tal lands, E. J. WOODHOUSE and T. B. FLETCHER (*Agr. Jour. India, 7 (1912), No. 4, pp. 343–354, pls. 2, fig. 1*).—This paper relates to the so-called "surface caterpillar" (*Agrotis ypsilon*), which for the last 15 or 16 years has destroyed the winter crops over an area of some 10,000 or 12,000 acres of Mokameh Tal lands. See also a previous note (E. S. R., 25, p. 757).

Studies in Itonididæ, E. P. FELT (*Jour. N. Y. Ent. Soc., 20 (1912), No. 4, pp. 236–248*).—This paper includes descriptions of 2 genera and 12 species of gall midges new to science.

The gall midge fauna of western North America, E. P. FELT (*Pomona Col. Jour. Ent., 4 (1912), No. 3, pp. 753–757*).—This paper summarizes our knowledge of the Itonidæ (Cecidomyiidæ) in the western half of North America.

The effect of oil of citronella on two species of Dacus, F. M. HOWLETT (*Trans. Ent. Soc. London, 1912, pt. 2, pp. 412–418, pls. 2*).—The author has found in work at the Pusa Research Institute that oil of citronella has an extraordinarily powerful attraction for males of the common fruit flies *Dacus diversus* and *D. zonatus*. It is thought that when the wind is favorable they may be attracted as far as one-half mile.

The mosquito, its relation to disease and its extermination, A. H. DOTY (*New York and London, 1912, pp. 79, pl. 1, figs. 10*).—A popular handbook.

Studies in the fossorial wasps of the family Scoliidæ, subfamilies Elidinæ and Anthoboscinæ, R. E. TURNER (*Proc. Zool. Soc. London, 1912, III, pp. 696–754, pls. 3*).—This paper gives descriptions of 1 genus and 15 species new to science.

On Orchestes fagi, a leaf-eating insect on beech, I. TRÄGÅRDH (*Skogsvårdsför. Tidskr. Fackafd., 1912, No. 1, pp. 33–42, figs. 9*).—An account is given of the life history of this curculionid, its distribution, and injury caused.

A contribution to the knowledge of the olive Rhynchites (Rhynchites ruber), F. SILVESTRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 151–170, figs. 13; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1890–1892*).—This is a report of investigations conducted from 1910 to 1912 at Leucaspide, near Taranto.

This beetle feeds upon the small terminal leaves and also destroys the apices of new terminal shoots, doing much damage before injuring the fruit. Later it attacks the fruit, beginning with those that are scarcely formed, in which it makes a puncture. The beetle continues its attack until the olives attain a length of from 7 to 8 mm. and a diameter of from 3.6 to 4 mm., and sucks the seed which is forming, this resulting in the drying up and falling of the fruit. Later it pierces the sarcocarp to obtain food and only makes a hole in the wall of the stone in order to deposit its eggs.

Experiments on a small scale indicate that a mixture of sulphur (96 per cent), pyrethrum (2 per cent), and naphthalin (2 per cent) applied with a blowgun from 4 to 6 times from early June to mid August prevents the attack.

The corn weevil (Calandra oryza), W. P. GEE (*South Carolina Sta. Bul. 170, pp. 16, figs. 2*).—Estimates of damage by insects to corn in South Carolina,

made by county demonstration agents, place the loss at from 2 per cent in some counties of the upper part of the State to as high as 75 per cent in some of the counties of the southern part of the State, the average damage in all counties being 13.8 per cent. The author estimates that a 5 per cent injury to corn, rice, and peas in the State would amount to an annual loss of $1,567,770.

In order to determine the percentage of injury, a sample of 12 of the best ears, and an equal number of the worst ears from a badly infested crib, were analyzed by T. E. Keitt, the station chemist. "The loss by weight in the badly weevil-eaten corn was computed from the average of many weights of a certain number of grains compared with sound grains from the same section of the same ear. This loss was 13 per cent of the entire weight of the grain. The loss by weight from the slightly weevil-eaten corn amounted to 0.05 per cent. Of the badly weevil-eaten corn 79.17 per cent of the grains were weevil eaten." The loss was largest in the protein, including more than 25 per cent of the total protein in the samples analyzed.

Examination of corn treated with carbon disulphid showed that instead of a decrease in the germinating percentage there seemed to be a slight increase in the germinating vigor of the fumigated over the untreated corn. The author concludes that fumigation dosages as high as 40 lbs. to the 1,000 cu. ft. of space have no injurious effects on the germinating properties of the corn. Germination tests emphasized the fact that weevil-eaten corn is unfit for seed purposes. Studies of varietal differences in weevil resistance led the author to conclude that there is none sufficiently large to warrant a change of variety which will decrease the yield. Those varieties which have a tight fitting shuck are the most free from weevils.

A brief account is given of the life history of this weevil and of control measures.

Note on a weevil enemy of the vine, P. CARDONNE (*Rev. Colons Afrique Nord, 1912, No. 7, pp. 145, 146, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, pp. 1897, 1898*).—*Otiorrhynchus allardi* is described as a grapevine pest in Algeria.

Otiorrhynchus ligustici injurious to apple grafts, G. LÜSTNER (*Geisenh. Mitt. Obst u. Gartenbau, 27 (1912), No. 7, pp. 104–106, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 8, p. 1898*).—It is stated that during the last few years the year-old grafted apple trees in the nursery at Geisenheim have been injured during their development by *O. ligustici*, which devours the leaves, beginning at the margin and working its way to the central nerve, and often resulting in the entire destruction of the leaves. The species is of frequent occurrence in Germany, Austria, and France. In the first 2 countries it attacks especially the vine; in France it damages both vines and peach trees. It is also known to be injurious to lucern, rose trees, various Leguminosæ, hops, and Umbelliferæ.

Rules and regulations of the Alabama State Board of Horticulture governing the importation of articles liable to contain the Mexican cotton boll weevil, W. E. HINDS (*Alabama Col. Sta. Circ. 16, pp. 7, figs. 8*).—This revision of rules and regulations is complete to June, 1912.

Gallfly parasites from California, D. T. FULLAWAY (*Jour. N. Y. Ent. Soc., 20 (1912), No. 4, pp. 274–282*).—Nine species of parasites reared from cynipid gallflies in California are described as new to science.

Foul brood, R. H. PETTIT (*Michigan Sta. Spec. Bul. 58, pp. 12, figs. 5*).—This bulletin is based upon Farmers' Bulletin 442, previously noted (E. S. R., 25, p. 361).

The activity of Prospaltella berlesei against Diaspis pentagona in Italy (*Jour. Econ. Ent., 5 (1912), No. 4, pp. 325–328*).—A translated abstract of the paper previously noted (E. S. R., 27, p. 564).

Red spiders and mites of citrus trees, H. J. QUAYLE (*California Sta. Bul. 234, pp. 483–530, figs. 35*).—The author states that, next to the scale insects, red spiders and mites are the most important pests of citrus trees in California. While spring is the most favorable season for spiders, they often become abundant also in the fall and less often at other seasons. Some of the worst effects of their injury, noted by the author, occurred in the fall and early winter of 1911.

"Where twigs are defoliated by their work, they may be killed or greatly weakened and such twigs are then likely to be attacked by other troubles such as the 'wither-tip' fungus and die-back. It occasionally happens that red spiders give trouble in packing houses by continuing to breed on the fruit, particularly the lemon, during curing or storage. It is possible, also, that mites may aid in the spread of decay infections while the fruit is in transit. After lemons had been kept in a tightly covered glass dish in the laboratory for 6 or 7 months we have taken numerous mites representing 3 different species. . . . There have been recognized 3 more or less well-known species of spiders and mites that attack citrus trees in California. These are the citrus red spider (*Tetranychus mytilaspidis*), the 6-spotted mite (*T. sexmaculatus*), and the citrus rust mite or silver mite (*Eriophyes oleivorus*)." The author's studies have shown that several other species are found on citrus trees but none of these are of recognized importance.

A brief account is given of these 3 species, their life history and habits, together with notes on *Tenuipalpus californicus*, *Tetranychoides californicus*, *Caligonus terminalis*, *Tetranychus bimaculatus*, *Bryobia pratensis*, *Tyroglyphus americanus*, *Gamasid* sp., *Tarsonemus approximatus*, and *Eremæus modestus*.

A key is given to the species of red spiders and mites recorded in this bulletin. The natural enemies noted are a neuropteron (*Conventzia hageni*), a rove beetle (*Oligota oxiformis*), a lady beetle (*Stethorus picipes*), a thrips (*Scolothrips sexmaculatus*), an itonid or cecidomyiid (*Arthrocnodax occidentalis*), the larva of which feeds on the red spider, a carnivorous bug (*Thriphleps insidiosus*), a brown lacewing (*Hemerobius pacificus*), a green lacewing (*Chrysopa californica*), etc.

The application of dry sulphur and hydrated lime, or of the commercial lime-sulphur spray, are the most effective control measures.

The clover mite (Bryobia pratensis), F. M. WEBSTER (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 290–295*).—The data here presented, relating to the occurrence of *B. pratensis* and its habits throughout the country, are supplementary to those presented in Bureau of Entomology Circular 158 (E. S. R., 27, p. 662).

FOODS—HUMAN NUTRITION.

Report of food commissioner, 1911, E. F. LADD (*North Dakota Sta. Bul. 1911, pt. 2, pp. 1–112, 128, 139–143, 151–215*).—Many food topics are discussed, with special reference to local conditions; official notices are quoted; the results of the examination of miscellaneous food products, beverages, and drugs are reported together with other data regarding the work under the state pure food law, the data being included in the reports of different divisions of the station concerned with pure food and drug work. The report also includes a number of papers by different authors, some of which have already been noted (E. S. R., 23, p. 371; 24, pp. 263, 666; 26, p. 462; 27, p. 64).

Data regarding others are as follows:

Report on emmer, by T. Sanderson (pp. 105–107).—A study of the milling and bread making qualities of emmer is briefly presented. A sample was used which contained 9.6 per cent wheat.

According to the author's summary, emmer mills much like durum wheat and can be tempered by long contact with water, though not by live steam. It has a low moisture content and can absorb much water. In baking strength and color of loaf it ranks with low grade or second clear flour from hard red spring wheats. The bread has a strong aroma and flavor and is of good quality considering that it is made from a product generally used as a stock food, but of little value compared with bread produced from wheat flour.

A comparison of Velvet Chaff with Fife and Bluestem wheats, crop of 1911, by T. Sanderson (pp. 108–112).—Velvet Chaff was compared with Fife and Bluestem wheats in continuation of work previously reported (E. S. R., 24, p. 263), milling and baking tests being made.

The reports for the year 1911 showed that the quality of the straight flour produced from the Fife and Bluestem wheats was in every way superior to that from the Velvet Chaff. The Fife and Bluestem wheats studied were slightly inferior and the Velvet Chaff decidedly inferior to those tested in 1910. The Velvet Chaff in 1911 was much better than the soft wheats which were milled experimentally and about on a par with the hard winter wheats in baking strength.

"The average figures for the several years show the Velvet Chaff wheat flour to be desirable for baking purposes, ranking near the Fife and Bluestem."

The acidity of flour in storage, by H. L. White (pp. 141–143).—According to the author's conclusions, "flours made from sound hard wheat and from sound durum wheat do not show any considerable increase in acidity of water extract when kept in storage for 2 years, even when stored under unfavorable conditions.

At the end of the 2-year storage period, all samples made good bread; but the hard wheat flours retained their baking qualities better than did the durum wheat flours."

A study of bread (white)—its acid and water contents, by L. A. Congdon (pp. 186–208).—The experimental data reported have to do with the water content and soluble acids of fresh bread, the comparative effect of different temperatures in obtaining the acidity of bread, the changes which bread undergoes on keeping, the effects of using dried skim milk in making bread, and similar topics.

According to the author's summary and conclusions, "bread (white) when fresh, contains on the average 25.15 per cent of water in its crust, 41.51 per cent of water in the interior of the loaf, 0.035 per cent of lactic acid [dry basis], about 0.219 per cent of water soluble phosphoric acid [dry basis], about 0.95 per cent chlorin and about 0.104 per cent of free hydrochloric acid [dry basis] . . . and about 0.70 per cent of ash or mineral matter.

"The average net weight of 21 samples of bread was 18.8967 oz., the average volume being 2,224 cc., and the average specific gravity was found to be 0.2487.

"Quantitative determinations of phosphoric acid increased as the acidity of the bread increased. The phosphate and phosphoric acid content was due to the yeast and flour used, more particularly to the amount of yeast used.

"The presence of hydrochloric acid is accounted for from the excess of sodium chlorid and the action of the phosphoric acid on this salt forming acid phosphates. The presence of lactic acid is accounted for from its being one of the products of alcoholic fermentation; the resultant reaction being lacto acid phosphate and phosphoric acid."

The acidity of commercial bakers' bread per 100 gm. (original basis) was on an average, for the crust, equivalent to 43.8 cc. $\frac{N}{20}$ Na OH; and the inside of the loaf, 35.7 cc. The acidity of the crust of homemade bread ranged from 32 to 42 cc. per 100 gm. of bread (original basis); and the inside of the loaf from 25 to 29 cc.

"Heating the bread increased its acid content, due perhaps to the change in the acid phosphates by means of excess of salt and phosphoric acid, forming hydrochloric acid which changed the secondary phosphates to the primary phosphates.

"The effect of dried milk in bread reduced the acidity about one-half.

"The amount of water in bread is of great importance and has a definite relation, on the average, with the amount of acid present; the higher the percentage of water, the higher the acidity on the average.

"The amount of water in bread should not be above 40 per cent in the interior of the loaf. If above this percentage, molds are likely to develop faster than when the amount of water is lower."

Report on the coating and polishing of rice, by L. A. Congdon (pp. 208–212).—From experimental data reported, the author concludes that the reason rice is coated is to cover up a poorer grade.

"Rice is stated to be prepared commercially by a polishing process, in which glucose, one one-thousandth, and talc, one three-thousandth part of the whole, are added. Paraffin and rice starch are sometimes used in place of glucose and talc.

"Rice may be said to be coated with talc, glucose, and rice starch if the percentage of solids in the washings of the rice is above 1 per cent, and the percentage of ash in the washings is above 0.1 per cent.

"Rice may be said to be coated with glucose and rice starch if the percentage of solids in the washings of the rice is above 1 per cent, and the percentage of ash in the washings is below 0.1 per cent.

"Rice may be said to be uncoated or not polished to any degree if the percentage of solids is below 1 per cent in the washings, and the percentage of ash in the washings is below 0.1 per cent; provided the rice has been tested for a coating of paraffin. Paraffin was found in 1 sample to the amount of 0.26 per cent."

Tennesee food and drugs inspection (*Tenn. Food and Drugs Insp. Bul. 5, 1911, pp. 100, fig. 1*).—In addition to other data, changes in the state pure food and drugs law are noted and the results of the examination of a large number of samples of food and drugs are reported.

[Legislative enactments] (*Bd. Agr., and Fisheries [London], Ann. Rpt. Intel. Div., 1911, pt. 1, pp. 112*).—A summary of legislative enactments in Ireland and Great Britain, chiefly regarding the sale of foods and drugs and fertilizers and feeding stuffs.

Court decisions regarding foodstuffs, Coermann (*Nahrungsmittel-Gesetzgebung. Giessen, 1912, pp. VIII+119; rev. in Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 9, pp. 603, 604*).—A collection of court decisions.

The composition of some New Zealand foodstuffs, J. Malcolm (*Trans. New Zeal. Inst., 44 (1911), pp. 265–269*).—Analyses are reported of oysters from Stewart Island, frostfish (*Lepidopus caudatus*), and kumara, or sweet potato.

Eggs and poultry as foodstuffs, E. Schmidt (*Eier und Geflügel als Nahrungsmittel. Berlin, 1911, pp. 28*).—This publication, which is No. 4 of the German Agricultural Society Leaflets, is a popular discussion of these foodstuffs.

The examination of bakers' goods, J. Gerum (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 8, pp. 513–516*).—The data reported have to do with

the examination of bakers' goods made with different fats and with and without eggs.

The principal starches used as food, W. GRIFFITHS (*Cirencester, 1911, 2. ed., pp. 70, pls. 28*).—In this edition the number of microphotographs illustrating the work has materially increased. The author has presented concise illustrated descriptions of starches from many sources.

Italian pastes containing eggs and milk, UTZ (*Pharm. Zentralhalle, 53 (1912), No. 2, pp. 35, 36; abs. in Chem. Zentbl., 1912, I, No. 8, p. 597*).—A number of analyses are reported and discussed.

Losses in the cooking of vegetables, JOSEPHINE T. BERRY (*Jour. Home Econ., 4 (1912), No. 5, pp. 405–412*).—In tests with spinach, cabbage, and carrots it was found that the losses in total solids, ash, calcium, magnesium, and phosphorus were greater in the boiled than in the steamed vegetables.

"The results of this investigation emphasize throughout the large percentages of mineral constituents extracted by boiling spinach, cabbage, and carrots in water; likewise a considerable proportion of soluble carbohydrate extracted from carrots. The green vegetables lost most heavily. Spinach gave up more than 50 per cent and cabbage more than 40 per cent of all salts present in the fresh substance; while the carrots which were cut up before boiling lost 11½ per cent of total salts, and 23 per cent of phosphorus in addition to 26 per cent of total soluble carbohydrate. . . .

"These trials, therefore, warrant the suggestions that wherever the materials extracted by boiling vegetables can not be acceptably utilized, a very large proportion of the loss of mineral salts from green vegetables and of soluble carbohydrate from roots may be prevented by cooking in steam. It seems probable that steaming root vegetables will protect from loss of mineral substances in like degree. It is proved, to the extent of these observations, that cooking carrots whole decreased the losses of both mineral salts and sugar in a sufficient measure to justify the use of this method of cooking rather than of the one more commonly employed."

Researches on the proteins of the seeds of chick peas, M. FORNAINI (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 199–222*).—Elaborate analyses are reported of proteins derived from chick peas (*Cicer arietinum*) of different sorts. A brief history of the study of vegetable protein is also given.

Food analyses No. XL, E. H. S. BAILEY and H. L. JACKSON (*Bul. Kans. Bd. Health, 8 (1912), No. 11, pp. 229–241*).—A considerable number of samples of canned fruits were examined, chiefly with reference to quality and the amount of tin present.

With respect to the alleged canning of rotten fruit, the authors state that in a number of cans it was evident that the fruit was spoiled before being placed in them. "In such fruit as peaches, pears, apples, apricots, etc., which have a light-colored and firm flesh and are usually packed in large pieces or slices, rotten fruit is easy of detection, and is shown by the same brown discoloration we recognize in the fresh fruit." The authors recommend that such goods be returned at once and other cans requested in their place. "In this way the responsibility can be transferred back through the retailer, wholesaler, and sale company to the original packer. If the people want protection they should be as ready and as active in their own protection as they expect public officials to be."

With respect to the canning of green fruit, the authors state that too little work has been done to warrant an extended statement but that some of the canned fruit opened gave the impression of having been packed green and was

of a very inferior nature. Such cans also should be returned and cans of good quality demanded.

Swelled canned goods, whether punctured and resoldered or in the original condition, should not be used, the authors insist, as "the wholesomeness of such goods is always questionable, and they may at any time be dangerous."

A special study was made of the presence of tin in canned goods. On an average, the samples designated "fair to excellent" contained 166.8 mg. tin per kilo, and the samples designated "in bad condition" 581.3 mg. tin.

Cocoas and chocolates, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 243, 1912, pp. 23*).—As the result of the analysis of 252 samples of goods purchased as cocoas and chocolates, the author concludes that it is unnecessary as yet to advise standards for cocoa and chocolate.

Some ways of adulterating peppercorns, A. Troccoli and G. Verona-Rinati (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 12, pp. 737–741*).—Methods of adulterating whole pepper are described.

A case of the gross adulteration of oil of lemon, Lauffs (*Ztschr. Öffentl. Chem., 18 (1912), No. 22, p. 438*).—The results of the examination of adulterated oil of lemon are reported.

Californian wines, G. Corso (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 97–102*).—Analyses of 6 types of Californian wines are reported. The author notes that Californian wines have recently begun to invade the European markets, including the Italian.

On the chemical composition of saké, T. Takahashi and G. Abe (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 18 (1912), Sect. VIIIc, pp. 349–357*).—Analytical data are reported and discussed.

Report of the committee on markets, prices, and costs of the New York State Food Investigating Commission, W. C. Osborn et al. (*New York, 1912, pp. 4+76, pl. 1*).—The statistical and other data reported were gathered chiefly in New York City, the publication as a whole being a progress report.

The modern household, Marion Talbot and Sophonisba P. Breckinridge (*Boston, 1912, pp. 8+93, pl. 1*).—The subjects discussed in this volume are the household as a social unit and as the center of consumption, shelter, food, clothing, management, domestic service, education, the activities of the household, and the household and the community. It has been the authors' purpose to present data which will lead housewives, either separately or in study classes, and students of social conditions in college and elsewhere, "to find ways by which the household of moderate income and with children may realize its possibilities as an organized group of human beings."

Housekeeping efficiency, C. Barnard (*Housekeeping Expt. Sta. [Conn.] Bul. 14, pp. 16, pls. 4, figs. 7*).—In this discussion of a kitchen outfit the author describes a number of utensils considered satisfactory, and gives estimates of the cost of equipping a kitchen and laundry, as well as a list of books considered useful for "progressive housekeepers."

Handbook of hygiene, edited by T. Weyl (*Handbuch der Hygiene. Leipsic, 1912, 2. ed., vol. 3, pts. 1, pp. 6+193, figs. 24; 2, pp. 194–297, fig. 1*).—The first of these parts contains two papers, namely: The Importance of Food Prices with Reference to Nutrition, by F. Eulenburg, and Foods and Food Accessories, by A. Stutzer. The second part contains a paper by T. Weyl on Commercial Products with Special Reference to the Legislative Enactments in the German Empire and Austria.

Concerning maximum and minimum metabolism in 24-hour experiments, von Bergmann and M. Castex (*Ztschr. Expt. Path. u. Ther., 10 (1912), No. 2, pp. 339–360; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 5–6, p. 199*).—The authors conclude that increased circulation of blood on the body surface increases heat excretion by conduction and radiation. The increase in metabo-

lism is a regulative function of the body and therefore a sort of chemical heat regulation.

Man's ability to digest vegetable foods. H. FRIEDENTHAL (*Pflüger's Arch. Physiol., 144 (1912), No. 5–7, pp. 152–168*).—In the author's opinion very fine grinding is essential when a vegetable diet is followed in order that assimilation may be increased and too great work of the digestive organs prevented.

The influence of meat extractives upon the thoroughness of digestion of vegetable food, H. WOLFF (*Ztschr. Klin. Med., 76 (1912), No. 1–2, pp. 66–76; abs. in Zentbl. Biochem. u. Biophys., 14 (1912), No. 1–2, p. 24*).—The addition of 5 gm. of meat extract to a vegetable diet not quite sufficient for maintenance induced a slight gain of nitrogen. The digestion and assimilation of fat and starch were improved. The extractives apparently are the activating causes.

The elimination of fat as influenced by the injection of fat, U. LOMBROSO (*Arch. Farmacol. Sper. e Sci. Aff., 14 (1912), No. 5, pp. 219–228*).—Experiments are reported in continuation of earlier work[a] on the effects of injections of fat on fat metabolism.

The fate of the injected fat was determined by post-mortem examinations, the injected fat being distinguished by staining with Sudan III.

The elimination of fat was increased as much as fivefold following the injection of fat, and there was a notable increase in the fat content of the blood. The function of the pancreas in fat elimination is discussed.

The origin and destiny of cholesterol in the animal organism.—X. On the excretion of cholesterol by man, when fed on various diets, G. W. ELLIS and J. A. GARDNER (*Proc. Roy. Soc. [London], Ser. B, 86 (1912), No. B 584, pp. 13–18*).—From the experimental data it appears, according to the authors, that "in man, as, in the case of other animals, the excretion of cholesterol in the feces can be accounted for by that taken in with the food, provided that the body weight remains constant. If, however, a rapid loss in weight takes place, as in illness, the output of cholesterol exceeds the intake. Further work will, however, be necessary before this view can be regarded as fully established."

According to data briefly reported regarding tests with rabbits, no cholesterol was found in the feces, which bears out the authors' contention that it is not a constituent of the normal feces of herbivorous animals.

Discussion of the results of Chauveau on the low value of fat in comparison with carbohydrates, as a source of energy for muscular work, L. S. FRIDERICIA (*Biochem. Ztschr., 42 (1912), No. 5, pp. 393–398; abs. in Chem. Zentbl., 1912, II, No. 13, p. 1137*).—A controversial article. The author concludes that carbohydrates and fat are equally economical.

Comparative studies of the effect of different sugars on dogs, G. SAINMONT (*Monatsschr. Kinderheilk., 10 (1911), pp. 579–595; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 11–12, p. 428*).—With like quantities (20 gm. a day) very different effects were noted. Cane sugar and grape sugar were markedly toxic, while milk sugar was much less so and galactose had practically no toxic properties.

Experiments on carbon dioxid excretion during static and negative muscular work, E. HAMMARSTEN (*Skand. Arch. Physiol., 26 (1912), No. 1–3, pp. 212–220, figs. 6; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 5–6, p. 199*).—Experiments with an improved ergometer led to the conclusion that negative work increases carbon dioxid excretion only in so far as its responsibility for keeping the muscles in a condition of contraction is concerned.

A review of the literature on the composition of expired air, H. LINDENTHAL (*Mo. Bul. Bd. Health Mass., n. ser., 7 (1912), No. 4, pp. 155–162*).—A digest of data.

[a] Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 37, pp. 608–610.

ANIMAL PRODUCTION.

The respiration calorimeter in Bonn and some investigations with the same with two oxen and one horse, O. HAGEMANN (*Landw. Jahrb., 41 (1911), Ergänzungsb. 1, pp. 438, pls. 8, fig. 1*).—The respiration calorimeter and the methods used in these experiments are illustrated and described in detail. Although a variety of feeds were given, the principal work was done with hays of different quality in continuation of earlier results obtained with sheep (E. S. R., 22, p. 71).

Four kinds of hay, varying much in botanical composition but similar in chemical composition, were found to vary greatly in nutritive value. The botanical analysis seemed to be the more reliable index to nutritive value. The horse was less able than the oxen to utilize the poorer hay, which consisted largely of wild grasses.

The composition of the hays and the digestion coefficients obtained with the horse are given in the following table:

Composition and nutritive value of hays of different quality.

Kind of hay.	Composition.					Digestion coefficients.			
	Nitrogen.	Ether extract.	Nitrogen-free extract.	Fiber.	Energy per 100 gm. organic matter.	Nitrogen.	Ether extract.	Nitrogen-free extract.	Fiber.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*Calories.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Poor hay	1.40	1.60	54.34	35.31	476.80	37.42	32.95	36.27	18.46
Medium hay No. 1	1.98	2.73	54.71	30.18	479.23	46.04	20.20	47.25	24.56
Medium hay No. 2	1.70	2.50	55.51	31.40	478.56	56.44	21.36	53.35	38.25
Good hay	2.52	2.61	51.56	30.10	480.28	65.37	33.76	56.46	41.97

The data obtained from these experiments are presented in full in tabular form.

The value of hays of different quality, O. HAGEMANN (*Mitt. Deut. Landw. Gesell., 26 (1911), No. 42, pp. 575–578; abs. in Zentbl. Agr. Chem., 41 (1912), No. 3, pp. 191–198*).—This is a discussion of data previously noted (E. S. R., 22, p. 71) and of those noted above.

Respiration apparatus for medium-sized animals such as sheep and swine, F. TANGL (*Biochem. Ztschr., 44 (1912), No. 3–4, pp. 235–251, pl. 1*).—This apparatus, which is essentially like that of the Pettenkofer-Voit calorimeter, with certain improvements later adopted by Atwater, Benedict, and Tigerstedt, is illustrated and described. Methods for determining the income and outgo of energy are given.

Analyses of fodder plants, grasses, ensilages, etc. (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1911–12, pp. 74–77*).—Analyses are reported of partridge field pea, hairy vetch, golden vetch, Portuguese lentils, perennial cowpea, native sorghum, Sixty-day oats, wheat, bunch spear grass, *Anthistiria membranæcea*, *Andropogon annulatus*, *A. pertusus*, *A. sericeus*, *Astrebla pectinata*, prairie grass, *Chloris barbata*, *C. truncata*, *C. virgatum*, *Eleusine indica*, *Eriochloa punctata*, spear grass, plume grass, darnel, millet grass, *Panicum colonum*, *P. crus-galli*, *P. distachyum*, *P. muticum*, *P. semialatum*, barley grass, native lucern, *Setaria glauca*, *S. macrostachya*, *Tricholæna teneriffæ*, corn silage, and mangolds.

Investigations on the composition and digestibility of some agricultural products from the German colonies in Africa, F. HONCAMP ET AL. (*Landw. Vers. Stat., 77 (1912), No. 5–6, pp. 305–350*).—Analyses of the following plants are reported: *Oryza sativa, Eleusine coracana, Pennisetum spicatum, Panicum colonum, Panicum* sp., *Phascolus mungo* var. *aureus, P. vulgaris, P. lunatus, Vigna sinensis, Cajanus indicus, Dolichos lablab, Mucuna lindro, Canavalia ensiformis, Arachis hypogæa, Sphenostylis stenocarpa, Voandzeia subterranea, Andropogon sorghum*, peeled banana meal, and banana peel meal. Metabolism experiments were carried out with the 4 last-named feeds.

Contribution to the study of Mexican forage plants, L. FORTUM (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 1 (1911), No. 8, pp. 754–757*).—Analyses are reported of cotton-seed hulls, leaves and twigs of *Brossimum alicastrum*, mesquite, teasel, spineless cacti, alfalfa, rice bran, and wild reeds.

Action of monocalcium phosphate on the preservation of green forage, G. SANI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 1, pp. 108–112*).—The temperature of a silo taken at different times showed that 300 gm. of monocalcium phosphate per quintal (about 3.5 oz. per 100 lbs.) of forage retarded fermentation. Chemical analyses are also reported.

Investigations on the composition and digestibility of some feeding stuffs, F. HONCAMP and B. GSCHWENDNER (*Landw. Jahrb., 40 (1911), No. 5, pp. 731–800*).—Digestion coefficients obtained with sheep are reported for the following feeding stuffs: Clover hay, corn-oil-cake meal, pine needles from which resin and tannin had been extracted, nonextracted pine needles, St. John's bread, ground peas, distillery slop from rye, distillery slop from corn, sesame cake, niger cake, sunflower cake, squash-seed cake, cotton-seed meal, and proprietary feeds.

Feeding stuffs, P. LIECHTI (*Landw. Jahrb. Schweiz, 26 (1912), No. 7, pp. 502–511*).—Analyses are reported of sesame cake, peanut cake, linseed cake, and wheat bran.

Commercial feeding stuffs, W. J. JONES, Jr., ET AL. (*Indiana Sta. Bul. 161, pp. 423–670*).—This contains the text of the state feeding stuffs law, terms adopted by the Association of Feed Control Officials, and other matters relating to feeding stuffs inspection.

Analyses are reported of red dog flour, by-products of wheat, rye middlings, buckwheat bran and middlings, cotton-seed meal, cold-pressed cotton cake, linseed meal, cake meal from unscreened flaxseed, distillers' dried grains, brewers' dried grains, malt sprouts, gluten feed; corn-germ meal, hominy feed, corn bran, corn flakes, corn, rice, and oats by-products, sugar-beet pulp, alfalfa meal, meat meal, beef scrap, tankage, cut clover, and condimental and mixed feeds.

[Analyses of feeding stuffs], J. W. INCE (*North Dakota Sta. Rpt. 1911, pt. 2, pp. 115–123*).—Rusted wheat straw was found to be richer in ash, fat, and protein and poorer in fiber than the unrusted wheat. The digestibility of the wheat was not determined. An analysis of Russian thistle gave the following percentages: Moisture 5.81, protein 18.25, ether extract 2.96, nitrogen-free extract 32.08, fiber 25.03, and ash 15.87 per cent.

Analyses are also reported of barley, flax bran, oil cake, screenings, green flax straw, brown flax straw, alfalfa, flaxseed screenings, wheat screenings, dried sugar-beet pulp, oat clippings, oat hulls, and weed seeds.

Commercial feeding stuffs, W. L. BOYETT and G. S. FRAPS (*Texas Sta. Bul. 154, pp. 3–71*).—Analyses are reported of barley chop, cotton-seed meal, cotton-seed cake, alfalfa meal, corn bran, corn chop, corn-germ meal, corn meal, wheat bran, shorts, rice bran, rice polish, ground oats, corn-and-cob meal, milo maize

chop, Kafir corn chop, cane-seed chop, low grade flour, dried brewers' grains, and proprietary feeds, together with other data connected with the inspection.

Commercial feeding stuffs, J. L. HILLS ET AL. (*Vermont Sta. Bul. 164, pp. 75–134, fig. 1*).—This contains the results of feed inspection and a report on condimental stock and poultry foods. Analyses are reported of cotton-seed meal, linseed meal, gluten feeds, corn-oil meal, distillers' dried grains, brewers' dried grains, molasses feed, provender, corn meal, wheat bran, wheat middlings, red dog flour, wheat screenings, and proprietary feeds.

Commercial feeding stuffs, L. MCLENNAN and C. I. BRAY (*Quart. Rpt. Okla. Bd. Agr., 1912, Dec. 31, pp. 106*).—This contains suggestions for balancing rations for feeding farm animals, the text of the state feeding stuffs law, and a report of the inspection of feeding stuffs.

An act to regulate the sale and analysis of foodstuff used for feeding live stock and poultry (*Massachusetts Sta. Circ. 34, pp. 7*).—This contains the text of the state feeding stuffs law of 1912, and supersedes Circular 17, previously noted (E. S. R., 22, p. 573).

First principles of feeding farm animals, C. W. BURKETT (*New York and London, 1912, pp. XVI+336, pl. 1, figs. 130*).—This is a popular work which discusses the principles of feeding animals with special reference to the needs of the student, stockman, and farmer.

[Live stock at Kodiak Station], C. C. GEORGESON and M. D. SNODGRASS (*Alaska Stas. Rpt. 1911, pp. 30–32, 61–64*).—A report of progress at Kodiak Station, which contains further proof that long-wooled sheep and the Galloway breed of cattle are well adapted to Alaskan conditions. The Cotswold and Lincoln grades of the station flock have been mated to pure-bred Lincoln and Cotswold rams, and an effort will be made to develop the milking qualities of the Galloway cattle.

[Animal industry in Jeverland], W. MÜLLER ET AL. (*Deut. Landw. Tierzucht, 16 (1912), No. 48, Ausgabe A, pp. 569–584, figs. 25*).—The entire number of this journal is devoted to a discussion of the present conditions of the live-stock industry in the northern part of Oldenburg near Jever, and contains a number of articles by different authors. The methods of breeding and management are described.

Curing meat on the farm, D. T. GRAY and L. W. SUMMERS (*Alabama Col. Sta. Bul. 166, pp. 179–204, figs. 4*).—This bulletin reports experiments in curing pork without the use of ice, and a study of shrinkage which takes place during the curing process.

Pork cured in common salt shrank much in weight during the soft period, but subsequently there was a greater loss in that cured in brine solutions, so that there was but little difference in the total loss by the two processes. The sides shrank less in weight than the shoulders and hams, the two latter losing approximately about the same weight.

Although only a small number of individuals were used, the work indicates that pork which was cured from hogs fattened on green pastures did not shrink any more than that from animals fattened on dry feeds. Hams which were cured from hogs fattened or partly fattened on soy-bean pastures plus concentrates shrank on the average 32.64, 33.41, and 29.32 per cent in the 3 different lots. When the hogs were fed in a dry lot on corn and cotton-seed meal the average shrinkage was 36.5 per cent, on dry lot, corn, and tankage 33.13 per cent, and on corn alone 30.24 per cent. In experiments the following year hams from hogs which were fed on peanut pasture all or part of the time shrank on an average 20.04, 19.74, and 20.69 per cent in the 3 lots, respectively. Hams made from hogs fed on corn alone shrank 20.88 per cent,

those on soy bean hay and corn 28.87 per cent, corn and tankage 21.28 per cent, and on corn and the grain of cowpeas 26.84 per cent.

The most favorable temperature of the water used for scalding hogs was found to be not over 175° F. A temperature from 150 to 155° loosened the hair, but the body of the animal must be held in the water more than one minute. If temperatures higher than 175° are used there may be some danger of "setting" the hair.

Data are also presented on the effect of temperature at slaughtering time. It was found that it is not necessary to have freezing weather at the time the hogs are killed as in one case the temperature was 70° in the shade and the meat kept perfectly.

Directions are given for killing, scalding, and dressing pigs, curing and smoking hams, and building a smokehouse.

Bibliography of physiology, edited by H. OBERSTEINER (*Bibliographia Physiol., 3. ser., 7 (1911), Nos. 1–2, pp. 158; 3, pp. 159–304; 4, pp. 305–592*).—This contains the usual bibliography on the physiology of animals, arranged systematically according to subject, and there is also an author index.

Momentum in evolution, A. DENDY (*Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 277–280*).—According to many physiologists, growth is controlled by internal secretions, and therefore abnormal growth in the individual, such as causes acromegaly, is due to an inhibition of some internal secretion which limits growth and commonly the life of the individual is threatened.

Applying this principle to a group of animals, the author suggests that where abnormal growth is advantageous in natural selection the inhibitory power is decreased and further growth takes place irrespective of utility. Eventually the size of the organ becomes too large to be compatible with the well-being of the individual and natural selection again steps in and eliminates the race.

The length of the gestation period in large domesticated animals, ESNAULT (*Rev. Vét. [Toulouse], 37 (1912), No. 12, pp. 721–725*).—This is a summary of information on the length of the gestation period in mares, cows, and sows.

Castration of both sexes without surgical operation, M. DUTTO (*Arch. Sci. R. Soc. Naz. Vet., 8 (1910), No. 7–10, pp. 151–155; abs. in Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), p. 197*).—An extract was prepared from the ovary of cows which rendered other species sterile when inoculated with it. It is thought that this may be used instead of the surgical operations of spaying and castrating.

Yearbook of scientific and practical animal breeding, edited by G. WILSDORF and R. MÜLLER (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. VII+473, pl. 1, figs. 32*).—This consists of the usual abstracts of the literature on this subject, and a number of original articles which are noted elsewhere in this issue.

Considerations on the treatment and evaluation of data on investigations in breeding, H. HENSELER (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 11–36*).—This discusses some applications of mathematics to investigations on the study of animal form, using the work of Gaude and Becker as illustrations (E. S. R., 27, p. 675; 28, p. 68).

A contribution to the knowledge of animal breeding in ancient times, and especially the breeding and management of cattle, HINRICHS (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 1–10*).—This contains information on the methods and conditions of animal husbandry in Germany in olden times.

The ox and its kindred, R. LYDEKKER (*London, 1912, pp. XI+271, pls. 24, figs. 5*).—This book treats of the ancestry of cattle, the wild white cattle of the British parks, the humped cattle of Asia and Africa, the origin of some European breeds, and the history of the extermination of the aurochs.

The specific morphological characters of the different types of cattle and the zoological position of the ox and other species of the genus Bos are discussed in detail by the author, who is inclined to the view that some of our European cattle breeds may have been of African origin. Throughout the work there are many references to the literature on the subject.

Studies on the Brachyceros cattle of Eastern Middle Europe, with special reference to a primitive breed of Volhynien Polessje, S. LIPIŃSKI (*Mitt. Landw. Inst. Leipzig, 1912, No. 11, pp. 1–133, pls. 3*).—An account of the origin and characteristics of the cattle of Volhynia. Measurements of the cattle are presented in tabular form, and there is a general discussion of the Shorthorn cattle of eastern Europe. A bibliography is appended.

Studies on the straight-horned cattle (Bos orthoceros), STEGMANN (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 37–65, figs. 4*).—An anatomical and historical study of the red colored straight-horned breeds of cattle in southern Russia, from which it is concluded that they originated as a cross between the zebu or banting and the domesticated cattle of Europe.

Comparative observations on the growth of different breeds of cattle in the second year, R. MÜLLER and P. ROSCHER (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 143–163*).—This contains tabulated data on the growth of the Algau, Pinzgau, Egerland, Wilstermarsch, Shorthorn, and Angler breeds of cattle.

A few observations on the foundation register of the Swedish Ayrshire Union, 1901–1907, N. INSULANDER (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 105–116, figs. 6*).—This gives the measurements and descriptions of some pure-bred Ayrshires.

Observations on growth in young cattle and oxen in the stable and pasture, J. GERRIETS (*Fühling's Landw. Ztg., 61 (1912), No. 17, pp. 561–577*).—The cost of feed consumed in raising a calf valued at 40 marks (about $9.52) was as follows: To 3 months of age 27.39 marks, to 1 year 114.99 marks, to 2 years 240.99 marks, and to 3 years 422.99 marks. This includes pasturage, but not labor or other incidental expenses. The gains in weight are also presented in tabular form.

A case of triplet calves, with some general considerations regarding multiple gestation in normally uniparous animals, R. PEARL (*Maine Sta. Bul. 204, pp. 259–282, pl. 1*).—This bulletin gives in detail a description of a set of triple calves produced by a grade Guernsey cow which had a hereditary tendency toward multiple gestation. The triples consisted of 2 females and 1 male, the latter being sexually normal in every particular and getting normal offspring, whereas the females never came in heat and probably were free martins. As regards color inheritance the male is typically a Guernsey, resembling closely his dam, whereas the females resembled more closely their sire, which was a grade Hereford.

A possible Mendelian interpretation of these facts and also the bearings of this case and other cases of multiple births are discussed with reference to problems of practical and theoretical animal breeding.

There are numerous references to the literature.

The supply of agricultural cattle in India, C. E. LOW (*Agr. Jour. India, 7 (1912), No. 4, pp. 331–342*).—This contains some statistical data and a discussion on the present status of the cattle industry in British India.

Breeding mutton sheep, H. DRAEGER (*Die Fleischschafzucht. Hannover, 1912, pp. VI+138*).—A study of the effect of the Merino and Merino crosses upon mutton production in France, with a view to obtaining information which might be of value to the German sheep breeder.

Fat-tailed sheep, J. C. EWART (*Abs. in Nature [London], 90 (1912), No. 2251, p. 450*).—An abstract of a paper read at the meeting of the British Association for the Advancement of Science, 1912.

The view is expressed that as the inland seas in central Asia dried up sheep found it necessary to store up fat as a means of providing nourishment through the long dry season. This led to the formation of fat-rumped and fat-tailed races and the long-tailed European breeds originated from fat-tailed ancestors.

"Evidence in support of this view is afforded by the fact that the fat in the tail gradually disappears when a sheep of the Afghan type is removed from the arid deserts of central Asia to western Europe, where green food is available throughout the year."

Sheep breeding in Great Britain, K. BITZER (*Die Schafzucht in Grossbritannien. Hannover, 1910, pp. 136, pls. 4*).—This is an account of the development of the sheep industry and methods of breeding and management in England, Scotland, and Wales.

Sheep farming in Russia, J. H. SNODGRASS (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 4, pp. 81–85*).—A report is given of the All-Russia Congress of Sheep Farming held at Moscow in 1912, with a general account of the progress of the sheep industry in European and Asiatic Russia.

Forage crops for swine, B. E. CARMICHAEL and G. R. EASTWOOD (*Ohio Sta. Bul. 242, pp. 551–564, figs. 6*).—Using pure-bred Duroc Jersey pigs weighing about 95 lbs. each, some home-grown supplements were tested during a period of 62 days. Estimating the corn at 56 cts. per bushel, soy beans at 90 cts. per bushel, skim milk 15 cts. per hundredweight, pasture $4 per acre for 62 days, and pigs at 6 cts. per pound of live weight, the results were as follows:

Results of feeding home-grown supplements to hogs.

Ration.	Average daily gain per pig.	Average concentrates consumed daily per pig.	Cost of gain per pound.	Profit per hog.
	Pounds.	*Pounds.*	*Cents.*	
Corn and skim milk 1:3	1.80	5.18	4.18	$2.03
Corn and soy beans 4:1	1.44	4.49	4.29	1.52
Corn	0.89	4.72	5.30	0.39
Corn on mixed pasture	1.43	6.10	4.45	1.37
Corn on clover pasture	1.59	6.17	4.05	1.92

The results of a similar experiment lasting 76 days are summarized in the following table:

Pasture and forage crops v. the dry lot for hogs.

Supplements to corn.	Average daily gain per pig.	Average corn consumed daily per pig.	Estimated replacement value of 1 acre of pasture.
	Pounds.	*Pounds.*	
Corn alone, on dry lot	1.21	5.41	.....
Blue grass and white clover	1.38	5.85	$5.82
Rape	1.45	5.58	16.95
Soy beans	1.54	6.07	15.06
Red clover (second crop)	1.70	6.40	11.06

In a third test, lasting 119 days and with pigs weighing about 45 lbs each, the average daily gain per pig on corn and tankage 9:1 in the dry lot was 0.79 lb., on corn and tankage 9:1 in soy bean pasture 1.08 lbs., on corn and tankage 9:1 in rape pasture 1.01 lbs., and on corn alone in rape pasture 0.95 lb. The estimated replacement value of 1 acre of pasture for the last 3 lots was $22.37, $32.13, and $35.22, respectively.

A fourth test with 2 lots of 8 pigs each lasted 140 days. The average daily gain per pig on mixed pasture supplemented with corn and tankage 9:1 was 1.25 lbs. and with corn and tankage 19:1 1.19 lbs. The cost of concentrates per pound of gain was 4.28 and 4.17 cts., respectively.

Analyses of these feeds showed that when compared on a dry matter basis rape was higher in protein than either soy beans or clover. Its low crude fiber content was another point in its favor. Sowed corn, sorghum, Canada field peas, and oats sown together were also tested, but none of them was found to be as useful as clover, rape, or even soy beans. It is concluded that spring sown crops can not take the place of earlier sources of green feed for swine, but should be used to supplement them. The green feeds used in these experiments ranked as follows in the order of efficiency: Red clover, Dwarf Essex rape, soy beans, and blue grass. The latter on account of its susceptibility to drought is not considered as satisfactory for midsummer use as the other crops.

On the retention of calcium, magnesium, phosphorus, and nitrogen in growing swine, S. Weiser (*Biochem. Ztschr., 44 (1912), No. 3–4, pp. 279–289*).—Hungarian swine when fed on a ration consisting exclusively of maize showed a loss of calcium and phosphorus, but a slight gain in magnesium and nitrogen. On barley and starch there was a slight gain also in calcium and phosphorus. When calcium carbonate was added to each of the above rations there was a normal retention of calcium and phosphorus, but a corresponding decrease in the retention of magnesium.

The minimum energy requirement of swine, F. Tangl (*Biochem. Ztschr., 44 (1912), No. 3–4, pp. 252–278, figs. 4*).—The respiration calorimeter was used to determine the income and outgo of energy with 4 castrated male swine, 2 of them Yorkshires 7 months of age and 2 of the Mangalica breed about 15 months old.

As a result of this work the author finds that the minimum daily energy requirement was 19.6 calories per kilogram of live weight, or 1,060 calories per square meter of surface in fattened animals, and 24.2 calories per kilogram of live weight or 1,100 calories per square meter of surface in unfattened animals. These figures agree closely with the previous work of Meissl [a] and Voit [b].

The antiquity of the horse in the River Plata region, A. Cardoso (*An. Mus. Nac. Buenos Aires, 3. ser., 15 (1912), pp. 371–439, 459–462, figs. 16*).—A résumé of the evidence regarding extinct Equidæ in South America and the early importations of horses from Europe. The author concludes that the South American horse is a pre-Columbian descendant of *Equus rectidens*, and that its ancestors have been in that locality continuously since Pliocene times.

The present breeds of horses and the academic conception of breed (rasse), F. G. Kohn (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 66–104, pl. 1, figs. 2*).—A discussion of what is meant by breed, race, and type in horses. A bibliography is appended.

Concerning the length of pregnancy in mares, W. Grooneveld (*Veeartsenijk. Bl. Nederland. Indië, 22 (1910), No. 5, pp. 361, 362; abs. in Jahrb.*

[a] Ztschr. Biol., 22 (1886), pp. 63–160. [b] Ibid., 41 (1901), p. 113.

Wiss. u. Prakt. Tierzucht, 7 (*1912*), *p. 187*).—In 250 cases of foals born in the Dutch East Indies the average length of pregnancy of the mares was 322 days, with a range of from 292 to 344 days. The average weight of the foals was greater in the longer periods of pregnancy. There was no appreciable difference between the length of pregnancy in the case of a male or female foal.

The problem of the Elberfeld educated horses, F. HEMPELMANN (*Zentbl. Zool. Allg. u. Expt. Biol., 1 (1912), No. 11–12, pp. 401–414*).—This is a bibliography and a review of the literature on this subject.

Fat deposition in the testis of the domestic fowl, R. PEARL and ALICE M. BORING (*Science, n. ser., 36 (1912), No. 937, pp. 833–835*).—By feeding Sudan III the authors found that fat was deposited in both testis and ovary of both young chicks fresh from the incubator and chicks 1 week old. When the stain was fed to adult males in full sexual vigor an abundant deposition of pink stained fat was found in the interstitial tissue of the testes.

"The deposition of fat in testis and ovary, as above set forth, bears no apparent relation to the functional sexual activity of those organs, since it occurs from the time of hatching on. So far as the available histological or physiological evidence indicates, sexual activation of ovary and testis in the fowl begins at the earliest not until some weeks after hatching."

Poultry breeding, M. PURVIS (*Chicago, 1912, 2. ed., pp. 348, pl. 1, figs. 55*).—To the earlier edition of this book (E. S. R., 23, p. 477) has been added an index, and data on Indian Runner ducks, egg records, incubation, and the Buttercup and Campine breeds of fowl.

DAIRY FARMING—DAIRYING.

The influence of the stage of lactation on the composition and properties of milk, C. H. ECKLES and R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 155, pp. 88, figs. 14*).—This is an investigation of the composition and other properties of milk occurring in the normal period of lactation, in which changes due to other causes were minimized. The animals used consisted of 2 Ayrshire, 3 Jersey, 3 Holstein Friesian, and 3 Shorthorn cows, which were kept on a uniform ration of alfalfa and grain 3:2, the grain consisting of oats, bran, and corn meal in the proportions of 1:1:8. The amount fed varied to suit the individual animal. Milk was also tested from 5 other Jersey cows, which were not kept on uniform rations throughout the year.

Composite samples were prepared from the milk of each cow in 7-day periods, but in the ash determinations 4 of the 7 samples were combined. "The total protein was found to be abnormally high following parturition and continued to decline until the third or fourth week, when the minimum was reached. It then remained fairly constant until near the end of the lactation period, when it rose rapidly and reached the maximum at the end of the period. The range in the total protein on the average was more than that for the fat.

"The casein constituted 80 to 82 per cent of the total protein and seldom went beyond these limits. It showed the same changes during the lactation period as described for the total protein.

"The determination of the nitrogen as albumin by the official method was unsatisfactory. Eliminating minor variations, the albumin bears almost a constant ratio to the total protein and therefore follows the same variations during the lactation period. On the average, 81.4 per cent of the total protein is casein, and from 7 to 9 per cent was determined as albumin. No relation was found between the protein and the sugar.

"The percentage of fat on the average declined during the first 3 months, followed by a period of 4 to 5 months with but little change. From this point

a rapid increase was found to the end of the lactation period. The variations in the fat and protein were on the whole quite similar. Sudden variations in the percentage of fat are, however, not accompanied by corresponding changes in the protein, but gradual changes in the fat go with corresponding variations in the protein. On the average there is 0.86 lb. of protein and 0.71 lb. of casein to 1 lb. of fat. Therefore, for each pound of protein on the average there was found 1.16 lbs. of fat.

"The lactose is the least variable of the constituents except the ash. The only change that is attributable to the stage of lactation is a slight decline near the close. The total solids show the same variation as the fat and protein, i. e., a slight decline at first, then practically no change for 8 or 9 months, followed by a rapid increase to the end of the lactation period. The total protein averaged 27 per cent of the total solids, the casein 22.1 per cent, the albumin 2.3 per cent, fat 31.3 per cent, sugar 37 per cent, ash 5.3 per cent."

The stage of lactation exerted a marked effect upon the relative size of the fat globules, which were specially large the early part of the lactation period, declining rapidly during the first 6 weeks, and remaining constant for 5 or 6 months, after which the decline was much more rapid to the end of the lactation period. Variation in the relative size of the globules could not be correlated with variation of any of the constituents of the milk, except that the data indicated that small fat globules were accompanied by a low Reichert-Meissl number. The melting point of the butter fat was not influenced to any extent by the stage of lactation, although in some cases there was a high melting point in the beginning and at others a low, except that there was a lack of uniformity at the beginning of the lactation period, due probably to the fact that the animal under some conditions utilizes the body fat at that stage of lactation. After the first few weeks the melting point remained practically constant, until near the end of the period, when it rose, accompanied by a high iodin number and a low Reichert-Meissl number.

"The refractive index was not affected to any appreciable extent by the stage of lactation. The Reichert-Meissl number showed a uniform decline on the average from the beginning to the end of the lactation period. Of the total number of analyses, 41.6 per cent came below 25, which is the standard set as a commercial limit for butter, while 7.5 per cent of the total number came below 20. In the beginning of the lactation period the variations in the Reichert-Meissl number were irregular. From this time on there was a gradual decline until near the end, when it became more marked. The Reichert-Meissl number is more influenced by the stage of lactation than any other of the physical constants except the relative size of the fat globules. The iodin number ranged from 23.8 to 49.4, while 47.4 per cent of the whole were between 30 and 35. A lack of uniformity is found in the beginning of the lactation period. After this stage is passed there is a slight but gradual increase until near the end, when it increases more rapidly until the highest point is reached at the end.

"The stage of lactation exerts a uniform effect upon the saponification value. There is a uniform decline from the beginning to the end of the lactation period, with the exception that the decline is more rapid during the last 3 months. The decline is uniform with the decrease in volatile acids. The lowest figure among the 488 determinations was 200.1, and the highest 252.3, while 80.6 per cent of the total number came between 220 and 235.

"The churning of the cream became more difficult toward the end of the lactation period, and with some cows samples were found that could not be churned under any conditions. An abnormal odor and flavor developed in the milk of certain cows when near the end of the lactation period. This condi-

tion was not present in the freshly drawn milk but appeared within 12 hours, even when the milk was held at 10° C."

The details of the work are reported in tabular form, and there is a summary of previous investigations on the subject.

Methods used in the Hohenheim investigations for computing the decrease in milk production due to the advance in the lactation period, A. MORGEN, C. BEGER, and G. FINGERLING (*Landw. Vers. Stat., 77 (1912), No 5–6, pp. 351–397; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2020–2025*).—This is a discussion of methods for overcoming the error occurring in metabolism experiments with milch cows because of the normal diminution of the milk yield toward the close of the lactation period.

Milking machines: Effect of machine method of milking upon the milk flow, G. A. SMITH and H. A. HARDING (*New York State Sta. Bul. 353, pp. 327–361, pl. 1, fig. 1*).—A continuation of earlier work (E. S. R., 22, p. 178), which contains a report of a study on the influence of hand and machine methods of milking upon the flow of milk, covering a period of over 4 years. On an average about 11 cows were milked by machine and an equal number by hand.

The total time required for preparing the machines, milking 12 cows, and washing the machines was 4.034 minutes per cow, or when reduced to a basis comparable to experiments reported by other observers 3.86 minutes. The average time required in hand milking was 7 minutes per cow. It is considered unprofitable to use machines in dairies of less than 15 cows.

The influence of machine milking upon the flow of milk was found to be too small to be measured, even when the other factors were eliminated as fully as possible. "It was probably responsible for less than 1 per cent of the variation in flow under the conditions of this experiment." There were also observed no objectionable local effects upon the cows or the flow of milk when the degree of vacuum used was varied.

It is concluded that there is still room for much improvement in milking machines, but that their success is closely associated with the personality of the operator. Details of the milk production of different cows are presented in tabular form.

Machine milking does not affect milk flow, F. H. HALL (*New York State Sta. Bul. 353, popular ed., pp. 3–11*).—A popular edition of the above.

The width of the jaw of cattle in relation to milk production and the weight of the heart and lungs, G. KORRENG (*Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 132–142*).—As a result of measurements of calves, bulls, and cows it is concluded that a narrow jaw in cows is associated with a high milk production, and a wide jaw with heavy heart and lungs. The weight of the heart was relatively larger in males than in females, and that of the lungs larger in females than in males.

The department's herds (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 4, pp. 395–397*).—This contains the milk records of the herds belonging to the New Zealand Department of Agriculture for the 1911–12 season.

Breeds of dairy cattle, M. A. O'CALLAGHAN (*Agr. Gaz. N. S. Wales, 23 (1912), No. 12, pp. 1045–1050, pls. 2, fig. 1*).—This contains yearly records of the cattle at the Berry Experiment Farm.

German cow-testing associations, A. W. THACKARA (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 30, pp. 646, 647*).—There are now 264 of these associations, known in Germany as Kontrollvereine, consisting of 4.048 members and controlling 112.034 cows. The greatest development has taken place in Mecklenburg and the Provinces of Brandenburg, East Prussia, and Schleswig-Hol-

stein. Those formed in Prussia have been organized through private initiative and under the guidance of the chambers of agriculture.

Report on the cow-testing associations in Malmöhus County, 1911–12, L. NANNESON (*Malmö Läns. Hushåll. Sällsk. Kvrtlsskr., 1912, No. 3, pp. 508–620*).—A report of the work of 160 different associations with 2,429 herds and 46,085 cows. Average data for each herd are given, with summary figures and discussions of the main results obtained.

Cooperative cow insurance societies in 1911 (*Jour. Bd. Agr. [London], 19 (1912), No. 9, pp. 763–773*).—Statistics of the cooperative cow insurance societies in England and Wales, of which there are 22 with 1,510 members and insuring 4,517 animals. The death rate per annum was 2.6 per cent.

Milk and its products, A. REITZ (*Die Milch und ihre Produkte. Leipsic, 1911, pp. 104, figs. 16*).—A popular work treating briefly of all phases of the dairy industry.

Investigations of market milk, G. L. J. GOOREN (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 25, pp. 625–646*).—The specific gravity, freezing point, fat content, bacterial content, enzym content, and other tests were made of several kinds of "sanitary" and "certified" milks found on the market, some of which were found to be more desirable from a hygienic standpoint than ordinary market milk. There is also an extensive review of the literature on studies relating to the pure milk supply.

The milk supply of San Francisco and its bacterial content, E. E. HUTSHING (*Cal. State Jour. Med., 11 (1913), No. 1, pp. 14–17, fig. 1*).—This reports bacterial counts and other data concerning the production of sanitary milk.

A study of the quantitative reduction of methylene blue by bacteria found in milk and the use of this stain in determining the keeping quality of milk, E. B. FRED (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 17–19, pp. 391–428*).—A review of the literature on the subject and a study of the reducing power of the various types of bacteria found in the milk of the herd of the Virginia Polytechnic Institute.

The results agree with those previously noted from other sources, that reduction is a general property of all bacteria but that the power varies according to species. Methylene blue is considered a quick and useful method for measuring the reducing power of bacteria and is thus of great practical importance in judging the quality of milk. The practical method of using the test in dairies is outlined and a bibliography is appended.

Some practical considerations on the presence of leucocytes and streptococci in milk, J. J. SCANNELL (*Amer. Jour. Pub. Health, 2 (1912), No. 12, pp. 962–970, figs. 2*).—This discusses methods of counting leucocytes and of determining the content of *Streptococcus pyogenes* and *S. lacticus*.

[Testing milk and cream] (*Massachusetts Sta. Circ. 33, pp. 11, figs. 2*).—This supersedes Circular 24 previously noted (E. S. R., 23, p. 781) and contains the text and interpretation of an act to regulate the use of utensils for testing the composition of milk and cream. Suggestions are also given by P. H. Smith for making the Babcock test.

Unwhippable cream, O. LAXA (*Milchw. Zentbl., 41 (1912), No. 12, pp. 369–373*).—Cream which would not thicken on being whipped was found to be infected with *Bacillus fluorescens liquefaciens*. The trouble disappeared when the cream was pasteurized.

Market inspection of butter. Better cream and a better marketing system for butter needed, B. H. RAWL (*Hoard's Dairyman, 44 (1913), Nos. 23, pp. 711–713; 24, pp. 736, 737; 25, pp. 769–771; N. Y. Produce Rev. and Amer. Cream., 35 (1912), No. 10, pp. 462–465*).—This is a paper read at the Minne-

sota Butter and Cheese Makers Convention, 1912. It discusses the need of a federal inspection law, moisture standards, improvement of the system of marketing, and some results of market inspection.

Moisture control of butter, I, O. F. HUNZIKER, H. C. MILLS, and G. SPITZER (*Indiana Sta. Bul. 159, pp. 285–360, figs. 16*).—This bulletin reports studies of the effect of breed, period of lactation, and feed on the chemical composition of butter, and of the influence of chemical composition, size of fat globules, and other factors not under the control of the butter maker on the firmness of butter. The analytical methods used are briefly described, and there are many references to the literature on the subject.

The authors summarize the results of their work as follows:

"The property of butter to mix with and hold moisture is largely controlled by its mechanical firmness or texture. Soft butter mixes with and holds moisture more readily than firm and hard butter.

"Aside from the process of manufacture the mechanical firmness of butter is governed by the chemical composition of the butter fat and the size of the fat globules. The olein content of butter fat is the most dominant factor in the determination of the mechanical firmness of butter. Generally speaking, the softness of the butter increases or decreases as the percentage of olein increases or decreases. The percentage of volatile acids may also influence the mechanical firmness of butter, but its effect is usually offset by more potent influences of other factors which operate simultaneously but in the opposite direction.

"The melting point is not a correct index of the mechanical firmness of butter. The melting point of butter fat is influenced by the volatile acids and olein. It is controlled by the relative proportion of the individual fatty acids.

"The chemical composition of butter fat is largely controlled by breed, period of lactation, and feed. The butter fat from Ayrshires and Holsteins contains less volatile acids and more olein and makes a softer butter than that from the Jerseys. At the beginning of the period of lactation the volatile acids are highest and the olein lowest. As the period of lactation advances the volatile acids decrease and the olein increases.

"The feed is the most dominant factor controlling the chemical composition of the butter fat. Feeds rich in vegetable oils, also blue grass pasture, produce butter fat relatively high in olein, low in volatile acids, and make a soft butter. Feeds rich in starches and sugars and poor in vegetable oils, also dry hay, tend to increase the volatile acids, decrease the olein, and produce a relatively firm butter.

"The size of the fat globules also affects the mechanical firmness and moisture content of butter. Other conditions being equal, cream with large average globules makes a softer butter which retains more water than cream with small average globules. The size of the fat globules is controlled largely by breed, period of lactation, and by changes of feed and other factors affecting the physical condition of the animal.

"The Channel Island breeds produce milk with much larger fat globules than the Ayrshires and Holsteins. Milk from fresh cows contains larger fat globules than milk from cows well advanced in their period of lactation. Abrupt changes of feed temporarily increase the average size of the fat globules."

Moisture control of butter, II, O. F. HUNZIKER, H. C. MILLS, and G. SPITZER (*Indiana Sta. Bul. 160, pp. 361–419, figs. 4*).—This is a continuation of the work noted above, and is a study of the conditions affecting the moisture content of butter which are under the control of the butter maker and the factors which influence the percentage of moisture found in butter after manufacture. Directions are also given for the control of moisture and methods of making moisture tests.

The results of the experimental work are summarized as follows:

"The richness and acidity of the cream, size of the butter granules, temperature of and churning in wash water, method of salting, and amount of salt used do not materially influence the moisture content of the finished butter.

"Large churnings yield butter with a higher percentage of moisture than small churnings. Butter from raw cream contains more moisture than butter from pasteurized cream. High churning temperatures make butter retain more moisture than low churning temperatures. Working the butter in water regardless of temperature increases the moisture content of butter. The secret of moisture control lies in regulating the churning temperature and in adjusting the amount of water present during the working process according to the firmness of the butter, as determined by the chemical, physical, and mechanical properties of the butter fat, and in the systematic use of a reliable moisture test.

"Conditions that cause the formation of round, smooth butter granules, such as very thin cream held at a low temperature for a long time and which requires excessive churning and tends toward salviness of the butter, make moisture control more difficult and the results more uncertain than when the butter granules are irregular, flaky, and not too firm.

"The moisture is not evenly distributed throughout the churn. For this reason it is not safe to run too close to the 16 per cent limit and it is advisable to establish 15 per cent as the danger line. In order to secure a representative sample of the butter in churn, it is necessary to take small portions of butter from all parts of the churn. When sampling, care should be taken to avoid water pockets.

"Some moisture is lost during the transfer of the butter from the churn to the tub or box and when printing the butter. This loss tends to be greater during the winter months when the butter is firm than during the summer months when the butter is soft. A conservative estimate puts the average loss of moisture in packing at about 0.5 per cent.

"Considerable moisture is lost during the storage of butter. This loss is controlled by the salt content of the butter and by the thoroughness of moisture incorporation. Unsalted butter loses very little, if any, moisture in storage. The more salt the butter contains the greater is the loss of moisture in storage. Butter in which the moisture is properly incorporated loses less moisture than butter with a loose and leaky body.

"The accuracy of the results of moisture determinations by the butter maker depends on the preparation of the sample, the sensitiveness, condition, and manipulation of the balance, and the carefulness and judgment of the operator in making the test. Most of the moisture tests now available for the use of the butter maker are satisfactory and yield reasonably accurate results if manipulated according to directions."

The dairy school, L. A. Brown et al. (*N. Y. Produce Rev. and Amer. Cream., 35 (1912), No. 6, pp. 302–304*).—A symposium by practical butter makers on the features of dairy school instruction which have been of most help to them.

Introduction to the manufacture and handling of Emmental cheese, A. Peter and J. Held (*Praktische Anleitung zur Fabrikation und Behandlung des Emmentalerkases. Bern, 1910, 2. ed., pp. VIII+108, pls. 9, fig. 1*).—A guide to cheese making, based on practical experience and scientific investigation.

Dairy statistics of Sweden for the fiscal year 1910, G. Liljhagen (*Meddel. K. Landtbr. Styr. [Sweden], 1912, No. 176, pp. 68*).—These figures, which contain reports of 133 dairies located in 13 counties, show a general increase in the

industry. The data include value of buildings and equipment, number of patrons and cows, methods of payment, net profits, and the production of milk, butter, and cheese.

VETERINARY MEDICINE.

Report of the bacteriologist, C. E. MARSHALL (*Michigan Sta. Rpt. 1912, pp. 151–181*).—This includes a report by Miss Rademacher on the commercial phases of the laboratory, viz, hog cholera serum, tuberculin, and legume cultures distribution, and 2 papers, as follows:

[*The use of salt solution in the production of hyperimmune serum against hog cholera*], by W. S. Robbins (pp. 151–178).—In manufacturing antihog cholera serum by the Dorset-Niles subcutaneous method the virus pigs are sacrificed for their blood, and this is only sufficient to hyperimmunize one pig of the same size as the virus pig. An attempt was made to reduce the cost of producing the serum by employing the principle set down by Craig and Madaus (E. S. R., 23, p. 185). Experiments were run parallel with the Dorset-Niles method. In the work 56 virus pigs were injected with salt solution (0.75 to 0.85 per cent at 37.5° C.) in amounts varying from 20 to 45 cc. per pound of body weight. The time in which the solution was allowed to remain in the abdomen varied and ranged between 3 and 14 hours. With the virulent salt solution taken from the abdomen 43 pigs were hyperimmunized, giving subcutaneous injections in amounts varying from 10 to 20 cc. per pound of body weight.

The data, reported in tabular form, indicated that the virulence of the salt varied greatly with the amount of injection as well as the time retained in the abdomen. The percentage of injected solution recovered varied greatly with the size and age of the pig as well as with the time in the abdominal cavity. Salt solution injected in amounts not exceeding 30 cc. per pound of body weight and allowed to remain in the abdomen not less than 5 hours, or for a longer time, was found to be efficient in hyperimmunizing animals.

Subsequently, about 100 pigs were hyperimmunized, using 6 hour, 30 cc. virulent saline solution, together with virus blood, and all produced very potent sera. "Thus these results look suggestive of a considerable saving in the cost of manufacturing serum."

Avian tuberculosis, by W. Giltner (pp. 180, 181).—New outbreaks of tuberculosis in chickens were noted during the year. The tests reported did not indicate that cohabitation surely or quickly resulted in the transmission of the disease.

Seven White Leghorn hens kept in company with tuberculous hens, and later in uncleaned pens, showed no lesions of tuberculosis after 7 months. Some more recent tests are also reported on negatively. The disease could not be transmitted to white rats by subcutaneous injections of cultures or keeping the animals in cages occupied by tuberculous birds. No satisfactory results were obtained from making a microscopic examination of the swabbings from the cloaca or from droppings.

Some apparent relationships between the etiologic organism in Jöhne's disease of cattle and that of avian tuberculosis led to a test of the effects of the avian germ on calves. "On May 17, 1911, twin calves about 2 weeks old were fed in milk the finely chopped organs of a tuberculous hen. The organs were seriously affected. This material was entirely eaten only after 2 days. Slight diarrhea supervened and rapidly disappeared. On July 5, the male calf died suddenly from acute tympanites. No effects of the ingestion of tubercle germs could be seen at autopsy. On July 16 and 17 the female calf was tested with avian tuberculin. A normal calf was also tested at this time. The tuber-

culin was made by cultivating the avian tubercle germ in potato broth for 8 weeks and evaporating to one-fifth its original volume. . . . The laboratory calf had a slight diarrhea during the reaction. At 2 p. m. on the next day, the temperature was 103.2°." The test has not yet been verified by autopsy, but this is expected to be done later.

Flax experiments, J. W. INCE (*North Dakota Sta. Rpt. 1911, pt. 2, pp. 129–138*).—At least 32 cattle died in North Dakota during 1911 as the result of eating flax screenings.

Continuing previous work (E. S. R., 26, p. 86), analyses were made of a plat of flax grown at the station, and also of other samples. The percentage of prussic acid in the bolls was found to be, on a moisture-free basis, 0.094 on July 15, 0.017 on August 7, and 0.035 on September 9, and in the leaves on the same dates 0.337, 0.04, and 0.029. The stems contained 0.287 per cent July 15, 0.039 August 7, 0.03 September 9, and 0.02 October 20. Leaves from another source, sun-cured, contained 0.01 per cent. The young flax plants, ground whole, contained September 21, when 1½ in. high, 0.289 per cent; September 27, when 3 in. high, 0.277 per cent; October 4, when 4 in. high, 0.215 per cent; October 10, when 5 in. high, 0.211 per cent; October 16, when 5+ in. high, 0.2 per cent; October 20, when frosted slightly, 0.189 per cent; and October 26, when frosted severely, 0.161 per cent.

Other analyses showed a considerable amount of prussic acid present in flax, the percentage being the highest in young plants. Much apparently depended upon the time of the year that the sample is taken and the exposure of the flax to the influence of the weather. Outdoor curing, either the action of the rain or sun, lowered the amount of poison. Soaking in water green flax straw and straw which has been shocked in the field and exposed to the sun, rain, and snow for several months also showed a diminished amount of poison. "The green straw gave a decided test for prussic acid while the bleached straw gave none."

The author "failed to find free prussic acid liberated in germination of flax. Chloroform and ether both acted upon young green plants and a good deal of hydrocyanic acid was liberated. . . . As before stated, the amount of the poison in the flax falls off gradually, finally becoming almost negligible. Why then, should the samples of flax screenings have caused the death of so many cattle the past year? Our theory is this: The season was such as to prolong the growing period or to postpone the maturity of the flax. The plant remained green longer and perhaps the glucosid was arrested by frost, so that considerable of the prussic acid was available for liberation under proper conditions. These green parts of the plant, the leaves and stems, found their way into the screenings, and therefore caused the poisoning. Examination of the samples of screenings submitted showed that there was considerable green material present."

The hydrocyanic acid content of other materials, such as bitter almonds, peach, plum, and cherry kernels, cherry laurel leaves, vetch, etc., is also determined and reported.

The diagnosis of anthrax by Ascoli's method, F. FISCHOEDER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), Nos. 1, pp. 84–97; 2, pp. 169–182*).—Ascoli's method will give positive results where anthrax is present, but, on the other hand, it may show positive results in other cases as well. It should not, therefore, be used alone but in conjunction with some other method.

Precipitation in anthrax and hog erysipelas, M. DECLICH (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 5, pp. 434–454*).—The thermoprecipitin reaction in general is considered an excellent aid for diagnosing anthrax and erysipelas in hogs. Although it is one which is easily conducted,

it should not be employed by the ordinary practitioner without an adequate control. Other methods of diagnosis should be used.

Comparative investigations of the trypanosomes of East Prussian Beschälseuche and Algerian dourine, H. MIESSNER and WEBER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 3, pp. 188–224; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 49, p. 915*).—The investigations here reported have led the authors to conclude that Beschälseuche and dourine are identical.

A bibliography of 35 titles is appended.

The action of salvarsan on the causative organism of dourine (Beschälseuche), F. FAVERO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 35 (1912), No. 4, pp. 150–155; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 39, p. 721*).—This paper relates to the treatment of dogs, infected with *Trypanosoma equiperdum*, with salvarsan.

It was found that salvarsan prevented the development of the trypanosome when injected simultaneously with it or during the period of incubation. When injected after the appearance of the trypanosomes in the blood, they disappeared the following day.

East Coast fever in the Colony of Eritrea, M. CARPANO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 35 (1912), No. 19–22, pp. 821–862, pls. 3, fig. 1*).—This paper deals with the morphology and biology of *Theileria parva*. *Rhipicephalus appendiculatus* is said to be the tick which transmits the disease in Eritrea.

A bibliography of 47 titles is appended.

Tests with the new serodiagnostic method for glanders, W. PFEILER and G. WEBER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 43, pp. 785–788*).—This is a preliminary report on a study of the conglutination reaction (E. S. R., 23, p. 785), with 8 horses, 6 of which were glanderous and 2 healthy.

For determining the activity of the conglutinating system decreasing amounts of bovine serum, previously heated to 54° C. are mixed with 0.1 cc. of fresh horse serum and 3 drops of a 0.5 per cent sheep blood corpuscle suspension. The mixture is then filled up to the 1 cc. mark with physiological salt solution and placed in the incubator for about 1 hour. After this period conglutination should be absent in other tubes which serve as controls, i. e., those containing either fresh horse serum, bovine serum, or sodium chlorid solution acting upon sheep's blood corpuscles. The valuation of glanders bacillus extract, which is used in the test, is ascertained in the same manner.

For the actual test decreasing amounts of the serum from suspected animals are taken, and to these are added a titrated bacilli extract, fresh healthy horse serum, physiological salt solution, and finally bovine serum and sheep corpuscles. If no conglutination takes place, the reaction is positive, or in other words, anticonglutinins are present.

The value of the bacilli-conglutination method for diagnosing glanders, W. PFEILER and G. WEBER (*Berlin. Tierärztl. Wchnschr., 28 (1912), No. 47, pp. 873–875*).—In the above work it was shown that the sera from glandered horses could be differentiated from healthy sera with the conglutination reaction. The authors now report on some tests made with the bacterial-conglutination reaction.

It is believed that the phenomena of bacterial conglutination are highly interesting from a scientific point of view, but it is doubtful whether the method in its present form will be of value in actual practice for diagnosing glanders. Accordingly the blood corpuscle conglutination test is considered the better one.

Comparative investigations of the sera from 100 horses with the agglutination, complement fixation, and conglutination tests for diagnosing glanders, W. PFEILER and G. WEBER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 5, pp. 397–415*).—The first group of animals examined consisted of

45 sound horses selected on the basis of agglutination and complement fixation tests. All of these animals showed no inhibition of the conglutination reaction.

Fifty-four other animals which were found to be glandered with either the agglutination or complement fixation test were examined with the conglutination test. It was found that all which reacted with the complement fixation test also gave an anticonglutination test. On the other hand, 23 of the animals which gave the agglutination reaction could not be detected with the conglutination test.

In a third group, 5 animals were examined in which no reaction was obtained with either the agglutination or the complement fixation test. These animals were, however, condemned on the basis of the clinical findings, etc. Three of the animals gave a positive conglutination test and 2 were negative.

Another set of tests was made with horses not affected with glanders, which received subcutaneous injections of mallein for the purpose of determining whether or not the anticonglutination reaction was specific. The sera of these animals were tested by means of the agglutination, complement fixation, and conglutination reactions before and after malleinization. All the animals with one exception gave positive agglutination, complement fixation, and conglutination reactions 14 days after instillation of the mallein.

Evidently anticonglutinins are produced by injecting portions of the glanders bacillus into the organism.

Some tests in regard to the use of the proposed methods for diagnosing glanders in sound horses, A. DEDJULIN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 5, pp. 365–377*).—In order to determine how often the biological methods show glanders in sound horses, a study of the complement fixation, agglutination, malleinization, and precipitation tests was made. In the case of the complement fixation test the author distinguishes between the Schütz-Schubert and the Bordet-Gengou method.

In all 245 sound horses which showed no clinical manifestation of the disease, and 6 horses affected with glanders were used for the tests. The animals were located in 4 different districts but in one of the groups were horses which had passed through a course of pleuropneumonia. Both sexes were represented. Of the 245 sound horses 143 gave negative results and the remaining 102 showed positive or other doubtful results. Of these 102 animals 74 gave only one kind of reaction; 23, 2 reactions; and 5, 3 reactions. In none of the horses was 4 or 5 reactions positive or doubtful. Of the 74 cases where only 1 of the 5 reactions was obtained (positive or doubtful), 5 reacted to subcutaneous malleinization, 50 gave precipitations, 15 agglutinations, and 4 complement fixations. Coincidental reactions were noted in only 25 horses, in which 2 reactions agreed 19 times and 3 reactions 6 times. The agglutination reaction agreed with the precipitation reaction 12 times. In 2 cases the reaction after subcutaneous malleinization agreed with the agglutination test, and in another 2 cases the subcutaneous reaction gave the same results as the complement fixation test. In 1 case the ophthalmo reaction and agglutination reaction agreed, and in another case the complement fixation reaction agreed with the precipitation reaction.

If the doubtful reactions are left out of consideration, the results show that the ophthalmo reaction and complement fixation test did not show positive in a single instance and the subcutaneous malleinization was positive in only 4 cases; a positive precipitin test was obtained with 11 horses. A positive agglutination reaction was noted in 4 cases.

With the 10 horses which went through a cycle of pleuropneumonia 4 gave a doubtful precipitin reaction and 1 a doubtful agglutination test. The reac-

tions when applied to the 6 glandered horses which were in various stages of the disease gave positive results in every case.

In regard to diagnosing glanders in sound horses, B. SCHUBERT (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 1, pp. 102–104*).—This is a criticism of the work reported in the abstract above with particular reference to the findings with sound horses. It is claimed that Dedjulin, who uses mallein as an antigen in the complement fixation method, errs when he calls it the Schütz-Schubert method. Schütz and Schubert (E. S. R., 25, p. 181) do not claim that the complement fixation method is original with them but that they have applied the Wassermann reaction, which is used for diagnosing syphilis, to the diagnosis of glanders. Wassermann's reaction is based on Bordet's and Gengou's principles.

The findings reported by Dedjulin with the Bordet-Gengou method are in accord with those previously noted by the Schütz-Schubert method in the Pathological Institute of the Veterinary High School at Berlin.

The value of some new diagnostic agents for infectious abortion, S. BELFANTI (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 1, pp. 1–25*).—This work was done with 37 cows located in 2 separate barns. One of these herds suffered severely from infectious abortion. The purpose was to determine whether the agglutination and complement fixation tests, when using the antigen furnished by Jensen, were suitable for diagnosing the disease as it occurs in Italy; furthermore, if the method could be employed for detecting the disease in its first stages, and whether a positive test with pregnant animals would positively foretell impending abortion. In addition it was noted whether or not both the complement fixation and agglutination reaction were suitable for practical purposes, and if abortin was a satisfactory diagnostic aid.

Out of the 37 cows 10 aborted and the remaining 27 were more or less in the later stages of pregnancy. The sera from the cows that aborted 3 months later gave positive results with both the complement fixation and the agglutination test. In 2 cases, however, the agglutination test showed positive 7 months after abortion while the complement fixation test did not.

The conclusion reached is that the complement fixation test and agglutination test in certain cases run parallel and show that the disease in Italy is also caused by the Bang-Stribolt bacilli.

In another set of experiments the sera from 27 heifers, which had advanced to the sixth or seventh month of pregnancy, showed positive in 15 cases and negative in 12 cases with the complement fixation test, and with the agglutination test negative in 16, uncertain in 7, and positive in only 4 cases. Later 12 animals, all of which with one exception were pregnant, were examined with the same reactions. The sera from 6 animals previously nonreacting gave negative results but 2 other animals which were previously positive showed negative after abortion. Another cow after aborting showed negative 7 months later but positive after 9 months.

As a result of the experiments the conclusion is reached that the method will not foretell a possible abortion or indicate the time of birth. Abortin, on the basis of data reported, is considered an uncertain substance for diagnostic purposes.

Further experiments with the Mycobacterium enteritidis chronicæ pseudotuberculosæ bovis, Johne, and with vaccines prepared from this microorganism, F. W. TWORT and G. L. Y. INGRAM (*Vet. Jour., 69 (1913), No. 451, pp. 4–15; Centbl. Bakt. [etc.], 1. Abt., Orig., 67 (1912), No. 3, pp. 126–135*).—

This continuation of the investigation previously noted (E. S. R., 26, p. 783; 28, p. 179) led the authors to the following conclusions:

"*Bacillus phlei* used in preparing media for growing Johne's bacillus can be grown in such a manner as to contain very little of the substance on which the growth of Johne's bacillus depends. This 'essential substance' forms only a small part of an alcoholic extract of *B. phlei*. Johne's bacillus will not grow on media containing the wax separated out from the extract nor on media containing the fatty acids. Johne's bacillus may grow slightly on media containing certain strains of tubercle bacilli having bovine characters, and it is probable that the 'essential substance' which is present in the human type of tubercle bacillus may also be present to a slight extent in the bovine type, although the bovine type never makes an efficient medium.

"After growing outside the animal body for over a year one strain of Johne's bacillus has been acclimatized to grow slowly on glycerin liver broth without the presence of the dead bodies or extracts of other acid-fast bacilli. At the time of publication of our second paper only one strain of Johne's bacillus showed surface growth on fluid media containing extracts of other acid-fast bacilli. More recently several of the remaining strains have commenced to form film growth on such media. Johne's bacillus can produce the disease in goats as well as in bovines, and it is probable that other horned animals can take the infection.

"A diagnostic vaccine for Johne's disease prepared by growing the bacillus in a fluid medium containing the dead bodies or extracts of the human tubercle bacillus is not specific but, as we pointed out in a former paper, will also give a reaction with tubercular animals. If *B. phlei* is used in place of the tubercle bacillus in preparing the medium, Johne's bacillus will grow better, and a diagnostic vaccine can be obtained which is both efficient and sufficiently specific for practical purposes. Moreover, Johne's bacillus has recently started to grow on ordinary glycerin liver broth without the presence of extracts of other acid-fast bacilli, and a comparatively weak vaccine prepared from the culture has produced a definite rise of temperature in a bovine suffering from Johne's disease. In future it should be possible to prepare a sufficiently strong diagnostic vaccine by growing the bacillus on glycerin liver broth or on glycerin beef broth as is done in the preparation of Koch's tuberculin. In a positive reaction the rise of temperature usually occurs between the third and ninth hour, and may be accompanied by profuse diarrhea."

Eczema in cattle in epizootic form, N. Vysotskiĭ (*Arch. Vet. Nauk [St. Petersb.], 42 (1912), No. 2, pp. 188–191; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 39, p. 721*).—The author reports upon an epizootic outbreak of eczema in the Government of Smolensk.

Parasitic gastritis in sheep and cattle, R. C. B. Gardener (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 482–493, pls. 2*).—The serious losses which had occurred among sheep throughout Kent, known to be due to the presence of nematode worms in the abomasum, led to the investigation here reported.

It is stated that in the late winter and spring of 1911 the losses were very severe, on some farms as many as 50 sheep dying within a few weeks. The species found during the investigation were *Hæmonchus contortus*, *Ostertagia ostertagi*, *O. circumcincta*, and *Trichostrongylus extenuatus*.

The resistance of Ornithodorus moubata to various sheep dips, B. Blacklock (*Ann. Trop. Med. and Par., 6 (1912), No. 4, pp. 429–433*).—"The dips tested failed very frequently to prevent *O. moubata* feeding on an animal. Feeding ticks were not easily caused to loosen their hold by them. In test tube experiments the resistance of this species of tick to these substances in solution is

marked. Used in the strength recommended and for the time suggested these dips appear to have very slight effects on this tick. Possibly other ticks behave in a different manner under these applications."

Annual report of veterinary officer investigating camel diseases for the year ending March 31, 1912, A. S. LEESE (*Ann. Rpt. Vet. Off. Invest. Camel Diseases [India], 1912, pp. 19*).—This is a detailed report of work for the year ended March 31, 1912.

Studies on hog cholera, W. E. KING and R. H. WILSON (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 441–458*).—"Cholera-immune hogs can withstand intraperitoneal injections of large quantities of horse serum virus. Ten cc. per pound body weight can be injected without anaphylactic effects.

"Horse serum virus when injected into immune hogs is capable of stimulating the formation of antibodies in the blood of the treated hogs.

"Blood drawn from a hog at least 1 month after it has received an injection of horse serum virus is more potent than blood drawn at any earlier period.

"Two injections (intraperitoneal) of horse serum virus, 1 month intervening, consisting of 10 cc. and 5 cc. per pound weight respectively, appear to produce a more potent blood than that produced by one injection.

"It requires a larger dose of hyperimmune serum, prepared by this modified method, to protect against the test dose of virus, than is necessary with serum prepared after the original method. . . .

"The practical use of horse serum virus in the preparation of hyperimmune serum is open to question. The method, in so far as our results show, has two disadvantages: The animals used for hyperimmunization must be kept under treatment several weeks longer than when treated by the original method. A larger dose of the serum, as compared with that which is recommended by those engaged in preparing hyperimmune serum according to the original formula, must be administered.

"This work has resulted in further experimental evidence that horse serum virus represents an activated hog cholera virus. It would scarcely appear possible to produce hyperimmune serum as relatively potent as that which has been used in this work, were similar dilutions of the original cholera virus, in physiologic salt solution in vitro, used for the purpose of hyperimmunization in substitution for 'horse serum virus.'"

The trichina inspection, H. A. JOHNE, revised by R. EDELMANN (*Johnes Trichinenschauer. Berlin, 1912, 11. ed., pp. X+155, figs. 119*).—A new edition (E. S. R., 11, p. 594) of this guide to the inspection of meat for trichina.

Report upon the investigations of the pectoral form of influenza of the horse (Brustseuche) at the Royal Institute of Infectious Diseases, GAFFKY (*Ztschr. Veterinärk., 24 (1912), Nos. 2, pp. 65–76, fig. 1; 3, pp. 113–122; abs. in Rev. Gén. Méd. Vét., 20 (1912), No. 230, pp. 77–79*).—This paper presents the results of bacteriological studies, investigations of the histogenesis of primary lesions, period of incubation, experimental inoculations of laboratory animals and horses, and the rôle of rats, mice, and insects in the transmission of the disease.

In studies of 4,000 slides made from 523 fragments of various organs, the author failed to detect the presence of any causative organism. Sarcosporidia were frequently found in the diaphragm and intercostal muscles but were present in healthy as well as affected horses. Attempts to cultivate an organism aerobically and anaerobically from the lung tissue, blood from the lungs, pleuritic exudate, spleen pulp, etc., on various media containing blood serum resulted negatively. Two colts 6 months of age were slaughtered on the sixtieth and sixty-second hour, respectively, after having ingested feces and hay-

ing been inoculated with discharges from the affected animals (with which they were placed in contact) with a view to determining the tissues first attacked; in one a pneumonic focus with pleuritic infiltration was present, in the other a simple localized pulmonary edema. The intestinal wall of both animals was equally inflamed in places throughout its length. These investigations indicate a priority for the intestinal lesions, but further investigations are considered necessary in order to settle the question.

The incubation period was found to be about 30 days. Laboratory animals inoculated with, and fed upon various infected products, proved to be refractive and similar results were obtained from 6 horses to which various products from infected animals, including intestinal contents and fragments of pulmonary tissue, were fed. In an attempt to determine their possible rôle in the transmission of the infection, horses were fed upon the droppings and bodies of rats and mice which had been kept in cages into which dung from affected horses was introduced almost daily for nearly a month, but with negative results. Transmission experiments with various insects and arachnids resulted negatively.

On the etiology of the pectoral form of influenza ("maladie" typhoïde) of the horse, J. LESAGE (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 20, pp. 498–513*).—The author thinks that the influenza of the horse is a diplococcic septicemia and that the *Diplococcus pneumoenteritis equi* of Galtier and Violet may be the causative organism.

Salvarsan and its administration in the pectoral form of influenza in the Russian army, I. GORDSJALKOWSKY (*Abs. in Berlin Tierärztl. Wchnschr., 28 (1912), No. 39, pp. 720, 721; Amer. Vet. Rev., 42 (1912), No. 3, pp. 350–352*).—The satisfactory results following the administration of salvarsan subcutaneously in 23 preliminary cases, led to its use in the Russian army in January, 1911. In order to determine its therapeutic effect when injected into the blood, experiments were carried on with 50 horses; in 4 cases the injections were made immediately after the detection of the disease, in 35 cases on the second day, and in 3 cases on the third and fourth days.

The temperature usually fell 6 or 8 hours after administration and after 48 hours was again normal, the inflammation of the lungs and pleura disappearing at the same time. A second administration was necessary in 6 cases, as the temperature rose again, after a period of from 2 to 4 days, to 104° F. These horses were first treated with 2 gm. of salvarsan and the second time with 1 gm., which proved to be sufficient to insure complete recovery.

Other horses, in which the symptoms were less severe, were given doses varying from 1 to 1.5 gm. In these cases, after a slight recovery, a partial relapse occurred which necessitated a repetition of the injection, whereupon a rapid recovery followed. In the one fatal case among the horses treated with salvarsan the temperature increased and reached 108° after 4 hours.

It is stated that the dose administered to young horses of 1,100 lbs. should not exceed 2 gm. It is recommended that the administration be made at the onset of the disease, using a solution in the proportion of 1:500, which should be administered intravenously.

On the relation of fowl diphtheria to fowl pox, L. VON BETEGH (*Centbl. Bakt. [etc.], 1. Abt., Orig., 67 (1912), No. 1–2, pp. 43–50, pl. 1*).—The author finds that so-called fowl diphtheria and fowl pox are etiologically identical. The corpuscles (*Strongyloplasma avium*), described by Borrel[a] are the cause of the disease and can be referred to the Protozoa.

[a] Compt. Rend. Soc. Biol. [Paris], 57 (1904), No. 37, pp. 642, 643.

RURAL ENGINEERING.

Irrigation and river control in the Colorado River Delta, H. T. Cory (*Proc. Amer. Soc. Civ. Engin., 38 (1912), No. 9, pp. 1349–6515, pls. 92, figs. 35*).—This paper deals at length with the physical and financial development of irrigation and river control in the Colorado Delta during the past 10 years, and discusses in detail some of the most important engineering features, with a number of plans and specifications of engineering works under the U. S. Reclamation Service and private irrigation companies. In addition, considerable data are given on rainfall, stream flow, water duty, measurement and distribution of water, and the silt problem in irrigation canals.

"Because of the various successful and unsuccessful work done in the region, the engineering features of irrigation and river control along the lower Colorado are now understood, and engineering construction methods are thoroughly developed. The successful attempts in closing breaks along the river with rock fill barrier dams . . . have standardized this class of work. . . . The maintenance and operation of the irrigation canals involve caring for excessive quantities of silt. . . . The Colorado River Delta now presents no unusual unsolved engineering difficulties; its problems are chiefly matters of statecraft in both river control and irrigation."

Practical information on irrigation for British Columbia fruit growers, B. A. Etcheverry (*Dept. Agr. Brit. Columbia Bul. 44, 1912, pp. 119, pls. 24, figs. 35*).—This bulletin deals with the results of investigations on the irrigation systems in British Columbia, and gives a large amount of information on the use of irrigation water, more especially for fruit growers, new settlers, and irrigation companies.

As there are many districts where the supply of water is either insufficient or unavailable at a reasonable cost, it is necessary to supplement the natural flow of the streams by storage reservoirs. The water supply should be conserved and care and economy should be used in order to cover as much land as possible and prevent waste of water.

The topics discussed are selection of an irrigated farm and laying out the orchard; units and methods of water measurement; methods of conveyance of water; duty of water; irrigation and cultivation of orchards; irrigation of potatoes; irrigation of alfalfa; and the use of small pumping plants for irrigation.

Irrigation plants, G. H. Knibbs (*Off. Yearbook Aust., 5 (1901–1911), pp. 589–594*).—This gives statistical and other data on the physical and financial condition of private and government irrigation works in Australia from 1901 to 1911.

Centrifugal pump specifications, C. A. Carpenter (*Engin. Mag., 44 (1912), No. 3, pp. 345–347*).—In preparing specifications for centrifugal pumps, the investigations show that in addition to stating performance requirements full particulars should be given in regard to the properties of the water to be handled, the method of driving, the mechanical construction required, general location, and all other local conditions or surroundings that may affect operation, thus not only making the specifications general in all matters pertaining to the manufacturer, but also as closely related as possible to the service requirements. A set of mechanical construction specifications is suggested.

A large concrete pressure pipe, F. W. Hanna (*Engin. News, 68 (1912), No. 6, pp. 248–251, figs. 4*).—An outline of the construction and results of tests of a 36-in. reenforced concrete pressure pipe line for irrigation, which is 1¼ miles long and operates under approximately 70-ft. head. The pipe proper con-

sists of tiles of 1:2¼:3 concrete, each 6 ft. long and 3 in. thick, reinforced with $\frac{5}{16}$-in. wire and joined together by means of concrete collars, which are 3 in. thick, 8 in. wide, and reenforced circularly with 3 coils of $\frac{5}{16}$-in. wire and stiffened transversely with 8 $\frac{1}{8}$ by $\frac{3}{4}$-in. flats.

The line was tested by running first half full, then increasing to full capacity under full head. It was found at first to be leaky, but this was practically cured by a continuous small discharge of water carrying several loads of sawdust, after which successful tests were made under full head and capacity.

The success of these tests is attributed to excellent proportioning of the concrete, the use of a wet concrete mixture, assiduous spading of the concrete in the forms, continuous wetting of the tile for 10 days, care in calking joints, excellence in the collar design, laying the pipe in cool weather, and general care in all the details of the work.

Proceedings of the Fourth Annual Drainage Convention of North Carolina, compiled by J. H. PRATT (*N. C. Geol. and Econ. Survey, Econ. Paper 26, 1912, pp. 45*).

Destroying stumps with acids (*Agr. Gaz. N. S. Wales, 23 (1912), No 9, p. 786*).—This notes an experiment with nitric and sulphuric acids for destroying stumps. In treating a swamp mahogany stump 3 ft. 6 in. in diameter, 6d. (about 12 cts.) worth of acids were used and in 5 weeks' time the whole stump and roots had so rotted that they could be knocked to pieces with a hoe. A hole is bored in the stump with a 2-in. auger, deep enough to hold the required quantity of acids, the nitric acid is poured in and the sulphuric acid added in equal amount, the hole then being plugged air-tight with a wooden plug.

Highway work in North Carolina, J. H. PRATT and MISS H. M. BERRY (*N. C. Geol. and Econ. Survey, Econ. Paper 27, 1912, pp. 145, pls. 9*).—This bulletin makes a comprehensive survey of the physical and financial condition of highways in North Carolina during 1911, gives considerable practical advice regarding the construction of sand-clay roads, and includes a progress report by counties of road work in the State. On the basis of considerable tabulated statistical and construction data given, it is claimed that under the present system of road construction and maintenance practically $900,000 of the actual outlay was wasted during 1911, this being attributed to faulty and inadequate highway administration.

Culverts and small bridges for country roads in North Carolina, C. R. THOMAS and T. F. HICKERSON (*N. C. Geol. and Econ. Survey, Econ. Paper 28, 1912, pp. 56, pls. 20, figs. 14*).—It is claimed that there is a great lack of uniformity in the construction and use of culverts and bridges, and that many of those in charge of road work do not appreciate the need and the demand for good culverts and bridges. This paper, prepared in cooperation with the Office of Public Roads of this Department, presents a large amount of information relative to the proper location, design, and construction of waterways for country roads in a manner intelligible to the supervisor and foreman in charge of the county work, and is also of value to road engineers in general.

It includes wooden culverts and bridges, vitrified, cast-iron, and corrugated metal pipe, plain concrete culverts, and reenforced concrete bridges and culverts, with detailed plans and specifications.

Main public highways of South Carolina (*S. C. Dept. Agr. Com. and Indus., Route Book Nos. 1, pp. 21; 2–3, pp. 19; 6, pp. 14; 8–9, pp. 20, figs. 33*).—A set of sectional charts of the roads, all drawn to a uniform scale.

Earth roads and culverts, E. F. AYRES (*Oreg. Agr. Col. Bul., Ext. Ser. 4 [1912], No. 1, pp. 79, pl. 1, figs. 40*).—This bulletin deals with road administration in Oregon, and gives considerable statistical road data and a large amount

of information relative to the proper location, design, construction, and maintenance of sand-clay, oiled earth, and burnt clay roads, and of the necessary culverts and bridges. In addition are descriptions of several types of road building and maintenance machinery.

Good roads yearbook (*Official Good Roads Yearbook of U. S., 1912, pp. VIII+306, pl. 1*).—This publication gives a brief history of road building, outlines the work of the American Association for Highway Improvement, deals briefly with road legislation in each State and a suggested state aid bill, gives a large amount of information relative to the proper location, design, construction, and maintenance of earth, sand clay, gravel, macadam, bituminous macadam, brick, concrete, and asphalt block roads, and culverts and bridges, with a discussion of dust preventives, and treats at length of general highway administration and financing and with convict labor for road construction in the various States.

[List of references on the administration, building, and maintenance of roads] (*Olympia, Wash., 1912, pp. 41*).

The work of the agricultural motor Köszegi and its influence on the physical condition of the soil, F. BORNEMANN (*Mitt. Deut. Landw. Gesell., 27 (1912), Nos. 40, pp. 555, 556; 41, pp. 569–573; 42, pp. 581–583; 43, pp. 602–604; 44, pp. 613–619*).—The principal working part of this machine consists of 10 circular disks, mounted on an axle on a horizontal frame behind. Fastened to each disk are from 3 to 6 heart-shaped hoes, which strike the ground obliquely when the disks revolve and produce a complete scarifying of the ground in one operation. Several practical tests were conducted on various farms with this machine, and considerable data gathered relative to the physical condition in which the soil was left.

The results of these experiments indicate in general the following: This scarifier effects a remarkable loosening of the soil to the full plowing depth and pulverizes it as well as do garden cultivating implements, the work being finer the drier the soil. It increases the water capacity and the hydroscopic power of fine-grained soils, and regulates the percentage of moisture in sandy loam soils to between 6 and 8 per cent and in loamy and solid soils to between 13 and 18 per cent. These conditions persist for a long time, especially if the ground is later worked with ordinary plow and harrow. The capillarity of solid soils is made very active, so that rain and underground waters are rapidly utilized and evaporation is decreased; consequently, solid soils contain more moisture in early spring than if they had been plowed, but do not become so muddy and sticky under ordinary atmospheric conditions. However, in order to obtain the greatest useful water storage in these scarified soils it is necessary to break the capillarity of the soil as early as possible in the spring. The development of spring seeds in these scarified soils was very marked, the roots and stems being stronger than in ordinary plowed soils. Broad-rimmed wheels on heavy machines distribute the weight over more ground and harm the soil less.

Further experiments are to be conducted on the effect of heavy machines on soils to determine wheel widths.

Fuel oil, J. B. ALLSHIRE (*War Dept. [U. S.], Rpt. Quartermaster Gen. 1912, p. 18*).—Results of tests with two systems of oil burning indicate that a 70 per cent saving in fuel can be made by the use of fuel oil. "The installation of burners does not require the modification of the heating and cooking apparatus to be such that it can not with slight change be put back for the use of coal."

Plowing experiments, H. RAGING (*Agr. Gaz. N. S. Wales, 23 (1912), No. 10, pp. 867, 868*).—In connection with grain and hay experiments tabulated results of experiments are given showing slightly better returns for disk than for mold-

board plows. Results from different depths of plowing did not favor deep plowing.

[The operation and application of cultivating implements], GISEVIUS (*Landw. Hefte, 1912, Nos. 8, pp. 42, figs. 57; 9, pp. 40, figs. 67*).—These articles deal, respectively, with the general application and operation of harrows, rollers, and surface drags, and with rollers, cultivators, and spring-toothed cultivating implements.

Small farm buildings of concrete (*Chicago and Pittsburg, 1912, 1. ed., pp. 158, figs. 136*).—This is a handbook of practical information for the farmer, rural contractor, and rural engineer. Part 1 deals with the construction of foundations, floors, walls, stairways, steps, and roofs of small concrete farm buildings, and part 2 gives specific instructions, working plans, and tables of working data for the design and construction of dairy buildings, ice houses, hog and poultry houses, root cellars, machine sheds, and other similar farm structures of concrete. The fundamental principles of sanitation are particularly considered in the design and location of buildings for housing animals.

Cooperative [electrical] stations in rural districts (*Elect. World, 60 (1912), No. 23, p. 1207*).—Tabulated data are given on the cost of construction, running expense, income, and other data of 21 rural electrical substations in Denmark for supplying heat, light, and power to farms and rural communities. The stock is apportioned among the consumers according to their connected loads, one share being allotted for each incandescent lamp and 10 shares for each horsepower in motors. It is claimed that by charging the central station rate of 11 cts. per kilowatt hour for lighting and 5.5 cts. per kilowatt hour for motor service, these cooperative plants earn 9.8 per cent on the capital invested.

Water and sewage plants for country homes, E. S. KEEN (*Farm and Ranch Rev., 6 (1912), No. 22, pp. 958–960, figs. 4*).—The author outlines in detail several experimental pressure water supply systems and small sewage disposal systems. Of particular interest is a sewage disposal system consisting of a single chamber septic tank, discharging its effluent into a closed or anaerobic filter bed. The filter is enclosed in a tight masonry tank and the filtering material is graded from coarse at the bottom to fine at the top. The effluent from the septic tank enters the filter at the bottom and discharges at the top. It is claimed that this sytem has passed a satisfactory 3-year test, with occasional renewal of the filtering material.

Experimental disinfection of sewage, T. A. MURRAY (*Engin. Rec., 66 (1912), No. 24, pp. 664, 665, figs. 3*).—In connection with the design and construction of a sewage disposal work, experiments were conducted on the disinfection of sewage.

The results and cost data show that the use of oxidizing filters is cheaper. The conclusions are that owing to the difficulty of penetrating even the finer solids and of treating unstable sewage liquors with chlorin it will generally be found expedient to adopt the standard methods of sewage treatment in order to obtain nonputrescibility before disinfection is attempted.

RURAL ECONOMICS.

Cooperation in agriculture, H. W. WOLFF (*London, 1912, pp. IX+378*).—This volume discusses the fundamental principles of agricultural cooperation and gives a general outline of what has been accomplished along this line in various countries, with suggestions for the adoption of cooperative methods of credit, insurance, life stock improvement, education, land tenure, purchase of supplies, and the disposal of various farm products.

Ten years of agricultural credit (*Dix Ans de Crédit Agricole, 1900–1909. Paris, 1911, pp. XXX+477*).—Notes and tables are presented in this report showing the scope and purpose of agricultural credit organizations, giving their history and progress in France, and comparing them with similar organizations in foreign countries, together with general results obtained within the period 1900–1909.

Agricultural cooperative credit associations in America, J. W. PINCUS (*Nat. Stockman and Farmer, 36 (1913), No. 45, pp. 6, 8–10, fig. 1*).—This article describes briefly the conditions and circumstances leading to the establishment of agricultural credit associations in the United States by the Jewish Agricultural and Industrial Aid Society, the plan of their organization, how they are managed, their growth and progress, and some of their benefits.

The Farmers Educational and Cooperative Union of America: What it is and what it is doing, A. C. DAVIS (*Texarkana, Ark., 1912, pp. 51, pls. 3*).—This volume describes the work of the Farmers Cooperative Union of America and illustrates the possibility of cooperation among farmers in systematizing business methods and applying principles of scientific commerce in their work of production and distribution. Data are given showing the progress and extent of the work by States, with an appendix containing a directory of national and state officials, excerpts from an article on cooperation, and topics for discussion in local unions.

Agriculture in England, P. BESSE (*La Crise et l'Évolution de l'Agriculture en Angleterre de 1875 a nos jours. Paris, 1910, pp. XV+390*).—This volume presents a study of the evolution of English agriculture from 1875 to the present time, discussing at length prices, wages, and labor; the adaptation of products, methods, and cooperation to changed conditions; and the actual and economic distribution and production of agricultural wealth. A lengthy bibliography is appended.

[Agricultural conditions in Denmark], M. F. EGAN (*U. S. Senate, 62. Cong., 3. Sess., Doc. 992, 1913, pp. 34*).—This document presents some observations concerning agricultural conditions in Denmark relative to dairying, land tenure, education, cooperation, and government assistance to agriculture; contrasting these activities with conditions in other countries, and pointing out the underlying reasons for the difference in conditions noted.

An actual agricultural problem, J. LOPEZ MAÑAN (*El actual problema Agrario. Buenos Aires, 1912, pp. 92, figs. 28*).—Notes and charts illustrating the development of various agricultural activities in Argentina are here presented.

Among the farmers (*Alaska Stas. Rpt. 1911, pp. 67–75, pls. 2*).—Illustrations are given showing the progress of a number of farmers engaged in different types of farming in Alaska, and the agricultural possibilities of the country are depicted by extracts from letters received from settlers, especially as to their results with the seed distribution.

The demand for labor in agriculture, I. A. HOURWICH (In *Immigration and Labor. New York and London, 1912, pp. 103–113, fig. 1*).—This chapter discusses and illustrates the relative and absolute decrease of the rural population of the United States; extent and effect of migration of native Americans; comparative demand for labor in agriculture and industry; the tendency of farm machinery to displace the wage earner from agriculture; and its economic significance. An actual decrease in rural population from 1900 to 1910 is noted in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, Ohio, and Wisconsin. Some observations and comparisons are made regarding hours of employment and earnings of laborers in agricultural and nonagricultural occupations.

The wandering agricultural laborer of the Province of Saxony, S. SCHMIDT (*Kühn Arch., 2 (1912), pt. 2, pp. VI+273–606, figs. 13*).—This volume presents the scope and results of a special study of the wandering or day laborer in reference to agriculture in the Province of Saxony in 1910. It treats of the number and nationality of such laborers; the kind of work they do and its relation to the size and intensity of the particular operation; relation of laborers and wages; extent, causes, and effect of immigration; and the general economic condition of such laborers in the Province.

Farm land values based upon producing capacity, E. LAUR (*Fühling's Landw. Ztg., 61 (1912), No. 21, pp. 705–721*).—The author in this article discusses and illustrates the method of arriving at the actual and definite value of a farm from its producing capacity as determined by its size and net income.

The price of milk and the rental value of land. A. TAILLEFERT (*Terre Vaud., 5 (1913), No. 1, pp. 7, 8*).—Notes and tables are given showing the relation between the price of milk, capital invested, cost of production, and the rental value of land; it being noted that from 1903 to 1911 the price of milk increased 22.4 per cent, while the rental value of land increased 8.01 per cent.

The purchasing power of farm products (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 12, pp. 92–95*).—Notes and tables are here presented which show that the money value of 1 acre of the farmer's crop in 1909 was 72.7 per cent more than the money value of 1 acre of his crop in 1899, and that the average money value of the articles which a farmer buys was about 12.1 per cent higher in 1909 than in 1899, making a net increase in the purchasing power of the produce of 1 acre about 54 per cent during the decade. The aggregate production of crops in 1911 as shown was about 6.3 per cent smaller than in 1910 and 0.5 per cent smaller than in 1909, but the total value of crop production in 1911 was about 2.1 per cent greater than in 1910, and 3 per cent greater than in 1909. The money value of 1 acre of produce in 1911, according to the report, averaged about $15.48 as compared with $15.50 in 1910, $15.99 in 1909, and $9.48 in 1899. Other tables are given showing the quantity of a number of articles generally purchased by farmers purchasable by the value of 1 acre of corn, cotton, wheat, etc.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 12, pp. 89–96*).—This number contains the annual report of the Bureau of Statistics for the fiscal year 1912, including data on the purchasing power of farm products for 1911, an abstract of which is shown above. In addition data are given showing the range of prices of agricultural products at important markets, monthly receipts and stocks of butter and eggs, acreage and condition of winter wheat and rye, estimated production of cotton, 1912, with comparisons.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 14 (1912), No. 12, Sup., pp. 97–104*).—Tables and notes are presented showing farm value of important crops; areas, yields and values of a number of the principal crops in the United States for 1912, with comparisons; area, yield per acre, production, and value of tobacco, by types and districts, 1909–1912, inclusive; cotton production and prices; supply and distribution of cotton; trend of prices; together with other data concerning the beet-sugar crop in the United States for the year 1911–12.

Foreign crops, November, 1912, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 42, pp. 20*).—Crop estimates for Canada, Argentina, British India, Egypt, and a number of European countries are given for 1912 and compared with the crops of previous years.

AGRICULTURAL EDUCATION.

Agricultural education (*Reading, England: Univ. Col., 1910, pp. 131*).—This is the report of a committee of five appointed March 22, 1910, to collect information for developing the efficiency of agricultural and horticultural education and research at the University College, Reading. The investigation extended through one month, during which time the committee visited McGill University, the associated Macdonald College at St. Anne de Bellevue, the Central Experimental Farm at Ottawa, the Ontario Agricultural College, the University of Toronto, Cornell University, the University of Wisconsin, Harvard University, and Yale University.

The report is divided into 2 parts. Part 1 consists of notes on the organization, equipment, and work of the institutions visited, and of general observations upon agricultural education in America and England, with special reference to the needs of University College. The committee suggests that an extension section should be organized in that university, and that this work should receive systematic development; more attention should be given to the long-course students and postgraduate students and to vacation courses for teachers and others; pure science should be taught principally in the later stages of the agricultural course, the earlier stages being given a stronger bias toward practical work than is the case at present; the standards for admission of students should be gradually raised and students should be required either to show previous experience in farm work or to gain such experience during their course; the college farm should be educational, should develop its experimental side, and should specialize in dairying; the fruit station should be maintained; and experiments and research should be systematically planned, both with reference to local needs and to the special aptitudes of members of the staff.

Part 2 of the report deals with other aspects of university development and includes notes on libraries, on the teaching of domestic science to women in Canada, and on residence systems for students in agriculture.

The development of the agricultural institute of Montevideo, J. SCHRÖDER (*Rev. Inst. Agron. Montevideo, 1911, No. 9, pp. 127–184, pls. 4, figs. 11*).—An account is given of the development of the agricultural institute at Montevideo in the 5 years since its foundation on September 16, 1906.

The present movement for agricultural education of a secondary grade in Massachusetts, D. SNEDDEN (*Ann. Rpt. Conn. Bd. Agr., 44 (1911), pp. 54–66*).—A rather full discussion of the general plan of secondary agricultural education in Massachusetts. Excerpts from this paper are as follows:

"I believe, personally, that the future of agriculture in this country, the future of the making of a successful farmer, lies in giving the person an opportunity at a relatively early age to be trained along proper lines for farming, the training to be given to be made of a very practical character, and at the same time scientific to a degree. . . .

"It seems to me, personally, that we ought not to ignore the fact that we are going to decide the question some time as to whether the agriculture of the future, the larger opportunity of agriculture, is going to go on a capitalistic basis or continue on the old-fashioned basis. . . .

"It will not so develop unless the educational development of the future promotes it, and it seems to me that what we need is a system of agricultural education that will take large numbers of our boys and will equip them for that measure of independent work, and I am convinced that the fact is that education in that line will do more than any other single thing to promote that kind of development in this great field of industry. . . .

"A successful school of agriculture in Massachusetts must have as a foundation stone, an actual practical participation by the boy in his own work. . . .

"The ideal secondary school of agriculture is a school which is situated in the center of a fairly densely populated agricultural region, having such means of transportation that the boys can come from 6 or 7 miles around to the school, and, if necessary, to stay there long enough to do the work which is required, and that work which is practical."

Before agricultural departments can be organized in existing high schools of Massachusetts the boys who take agricultural work should be prepared to give to it more than half their time, on the basis of 8 hours a day. An instructor in the department must give his entire time to agriculture, and must be both a graduate of an agricultural college and a practical farmer. "If a boy is to be taught agriculture successfully he must be prepared to spend half of his time in practice."

Vocational agricultural education, R. W. STIMSON (*Trans. Mass. Hort. Soc., 1912, pt. 1, pp. 11–34*).—The origin, growth, and present status of vocational agricultural education in Massachusetts are summarized, with brief descriptions of the Georgia congressional district agricultural schools, Wisconsin county agricultural schools, agricultural schools at colleges, and separate agricultural schools.

The need for vocational schools, E. G. COOLEY (*Ed. Rev., 44 (1912), No. 5, pp. 433–450*).—This is a report made to the educational committee of the commercial club of Chicago, in which the author proposes "a system of vocational continuation schools, and part-time and full-time trade or technical schools, for youth of both sexes who wish or are compelled to enter agriculture, commerce, industries, or home making at 14, without the training provided by the secondary schools and universities. . . . Such schools should be separate, independent, compulsory day schools, supported by special taxes, carried on usually in special buildings, administered by special boards of practical men and women, taught by specially trained practical men from the vocations, and securing the closest possible cooperation between the school and the factory, the school and the farm, the school and the countingroom, or the school and the home."

Report of the extension work with the schools, as carried out through the schools' division, S. B. MCCREADY (*Ann. Rpt. Ontario Agr. and Expt. Union, 33 (1911), pp. 56–59*).—A report of progress made in school and home garden work in 1911.

[A model school cottage and gardens], A. E. WINSHIP (*Jour. Ed. [Boston], 76 (1912), No. 16, pp. 428, 429*).—This cottage is in a school yard in Los Angeles, and is inexpensively furnished as a home, where 2 teachers live, and where household duties are performed each school day by children from the third to the sixth grades. The boys have a school garden on the grounds where they raise vegetables for the supply of the cottage table, and gather and prepare them for the kitchen.

A brief account is also given of the school garden work in general in Los Angeles. The author believes that school gardening is doing much to educate the teachers as well as the children.

The qualifications of teachers of agriculture, G. A. BRICKER (*Texas School Jour., 30 (1912), No. 2, pp. 10–16*).—The qualifications mentioned and discussed briefly are rural mindedness, enthusiasm, harmonious adjustment, and professional knowledge.

Subject matter in nature study and elementary agriculture for 1912–13 (*Cornell Rural School Leaflet, 6 (1912), No. 1, pp. 186, pl. 1, figs. 117*).—It is

the purpose of this leaflet to aid the teacher in the rural school to work out the practical daily problem of teaching the agricultural subjects as outlined in the New York State Syllabus for Elementary Schools. All agricultural subjects, according to this leaflet, "must be taught by the nature-study method, which is to see accurately, to reason correctly from what is seen, to establish a bond of sympathy with the object or phenomenon that is studied."

Agriculture in rural schools in Michigan, W. H. FRENCH (*Mich. State Supt. Pub. Instr. Bul. 44, 1912, pp. 32, figs. 8*).—Suggestive exercises are given on samples of corn, wheat, oats, clover seed, and other grains brought from home, on home and school gardening, simple apparatus for performing experiments, soil studies, rotation of crops, live stock, plant propagation, and forestry. An outline for scoring dent corn, a score card for judging apples, and a spraying calendar are also included.

Agricultural project study (*Bul. Bd. Ed. Mass., 1912, No. 4, pp. 38*).—This bulletin is devoted mainly to the supervised farm work of pupils, and outlines the methods of instruction to be followed by special agricultural instructors and others in independent agricultural schools and in agricultural departments in selected high schools.

Project study outlines for vegetable growing (*Bul. Bd. Ed. Mass., 1912, No. 5, pp. 30*).—This bulletin discusses one phase of agricultural project instruction, with special reference to the work and study of first or second year pupils in state-aided vocational agricultural schools and departments. It suggests outlines by which the pupils may prepare themselves directly for their work and at the same time be taught how to gain desired information from all sorts of reference authorities.

Agricultural project study bibliography (*Bul. Bd. Ed. Mass., 1912, No. 6, pp. 48*).—This bulletin is intended as a guide in building up and maintaining working libraries for distinctively agricultural training in secondary vocational agricultural schools, and lists a large number of publications.

Books for farmers and farmers' wives, H. O. SEVERANCE (*Univ. Mo. Bul., Libr. Ser., 1 (1912), No. 4, pp. 24*).—This bibliography suggests titles on home economics, animal husbandry, dairy husbandry, rural economics and sociology, and other farm topics.

Agricultural instruction in the army, BRANDENBURG (*Fühling's Landw. Ztg., 61 (1912), No. 17, pp. 578–586*).—Suggestions are given for the improvement of agricultural instruction in the army based on information gained from 3 years of such instruction to troops in Alsace-Lorraine.

A community farm expert at work and what he has done (*Tribune Farmer [N. Y.], 11 (1912), No. 572, pp. 1, 2, figs. 6*).—This is a complete description of the organization, methods of work, and the results obtained by the Farm Bureau at Binghamton, N. Y. It is stated that during the past 18 months (1) more than 2,000 farmers have been reached by personal letter and by publications applicable to their problems; (2) of this number more than 100 are actively cooperating with the director of the bureau in growing new crops, practicing new methods, and trying out suggested solutions of their problems; (3) thousands of children in the public schools of the county have become interested in the more scientific side of agriculture through lectures and the organization of boys' corn clubs; (4) much information on local farm problems, soils, and crops has been disseminated through public lectures to schools and granges, and articles in the local papers; (5) a definite set of experiments in pasture renovation and management has been carried on in cooperation with the New York State College of Agriculture and this Department.

Special contests for corn-club work, O. H. BENSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 104, pp. 15, figs. 4*).—The contests described are seed-corn selecting, seed-corn stringing, plowing, corn judging, corn breed and variety naming, original problems in arithmetic relating to corn, manual training, drawing, language and composition, rope tying, and seed-corn germination. The basis of award is given for each contest, and a specimen record sheet, such as is supplied by the Bureau of Plant Industry upon request, is included.

Soil physics laboratory manual, J. G. MOSIER and A. F. GUSTAFSON (*Boston, New York, Chicago, and London [1912], pp. VI+71, figs. 9*).—These laboratory exercises are the result of 10 years' experience in teaching soil physics and are designed for one semester's work. Questions are asked and references given. An appendix of additional exercises is added for students who wish to pursue the subject further.

Field crops, A. D. WILSON and C. W. WARBURTON (*St. Paul, 1912, pp. 544, pl. 1, figs. 161*).—A manual of the field crops of the United States designed for use in secondary schools where agriculture is taught. Laboratory exercises and suggestions for supplementary reading appear at the end of each chapter.

Lessons in elementary cooking, MARY C. JONES (*Boston, 1912, pp. VI+266, figs. 10*).—These lessons, which are the result of some years of practical experience in work with beginners, comprise studies of the more common food stuffs, together with recipes for their preparation, general rules and recipes for invalid cookery, and directions for the care of the stove and fire, putting up a luncheon, table setting, dish washing, keeping food, etc. Time tables of cookery and tabular data as to food nutrients and their uses in the body are added.

MISCELLANEOUS.

Annual Report of Alaska Stations, 1911 (*Alaska Stas. Rpt. 1911, pp. 84, pls. 14*).—This contains the organization list and a report of the several lines of work carried on during the fiscal year ended June 30, 1911. Meteorological data and accounts of the extensive tests with field and garden crops and of the live-stock operations are abstracted elsewhere in this issue.

Twenty-fifth Annual Report of Michigan Station, 1912 (*Michigan Sta. Rpt. 1912, pp. 145–597, figs. 323*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are abstracted elsewhere in this issue, reprints of Bulletins 265 to 267, Special Bulletins 56 and 57, Technical Bulletin 11, and Circulars 12 to 17, all of which have been previously noted, and of Special Bulletin 58, abstracted on page 456 of this issue, and a financial statement for the fiscal year ended June 30, 1912.

Twenty-second Annual Report of North Dakota Station, 1911 (*North Dakota Sta. Rpt. 1911, pts. 1, pp. 103, figs. 2; 2, pp. 215*).—Part 1 of this report contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1911. The experimental work reported is abstracted elsewhere in this issue.

Part 2 is the report of the food commissioner, and includes in addition to data noted elsewhere in this issue analyses of soils, Paris green, sugar beets, linseed, soy bean, fish, and Japanese boiled oils, turpentine substitutes, and miscellaneous materials, and a report of fertilizer tests with corn and wheat.

NOTES.

Colorado College and Station.—E. R. Bennett has resigned as professor of horticulture and horticulturist to become horticulturist for the Rock Island railroad lines.

Delaware College.—The legislature has made much larger appropriations for the college than ever before, including $150,000 for the erection of an affiliated college for women, $15,000 for general maintenance for the biennium, $10,000 for agricultural extension work, $5,000 for a greenhouse, $5,000 for a chair of history, and $2,400 for the maintenance of a summer school for teachers.

Hawaii Federal Station.—A small modern creamery plant has been installed at the Glenwood substation, and about 1,000 pounds of butter per month are being made from milk received from neighboring dairymen and sold in Hilo at an average price of 55 cents per pound. The amount now manufactured is insufficient to supply the demand and a cooperative organization is being formed among the dairymen to build a larger creamery and take over the business. The substation will then devote its energies to the study of forage crops and silage.

Kansas College and Station.—The appropriations granted by the legislature for the ensuing biennium considerably exceed those now available. For maintenance $585,000 is granted, as compared with $450,000. The station is given $10,000 additional, or $55,000, and the extension work is increased from $75,000 to $95,000. Special studies are authorized in the production and dissemination of improved seeds with an appropriation of $15,000, and $4,000 is allotted to irrigation tests.

The substation at Fort Hays is granted $50,000 for maintenance and $7,500 additional as reimbursement for losses of buildings and equipment in a recent fire. The Dodge City substation receives $5,000, that at Garden City $10,000, and that at Tribune $5,000. Two additional substations are authorized, one near Colby, in Thomas County, in northwestern Kansas, and the other near Lakin, in Kearney County, in the southwestern portion. In each case the counties must provide 160 acres of land and after 1915 duplicate any state appropriations for maintenance. The Colby substation receives an initial appropriation of $15,000, of which $5,000 must be expended for pumps and other irrigation equipment. The Lakin substation is given $10,000 for buildings and equipment, and Kearney County is required to expend $7,500 within the next two years in drilling deep wells, irrigation studies, etc.

A new stallion-registration law was enacted providing for the licensing of all stallions offered for public service. This law is to be administered by a State live stock registry board, with headquarters at the college, and composed of the heads of the departments of agriculture, animal husbandry, and veterinary science.

Massachusetts College.—The fifth annual farmers' week attracted an attendance of nearly 1,000. Special interest was centered in milk production and

dairying, but sheep breeding, fruit growing, beekeeping, corn production, boys' and girls' clubs, and home economics were among the other varied activities to receive attention. An unusual feature was the sending by 32 of the state institutions of their foremen, farm superintendents, etc., to receive instruction.

A short course for tree wardens and city foresters was held April 2 and 3, with lectures and demonstrations on the planting, care, and preservation of trees.

Minnesota University and Station.—Ralph Hoagland, professor of agricultural chemistry and soils in the university and chemist in the station, has accepted an appointment in the biochemic division of the Bureau of Animal Industry of this Department. He will be succeeded May 1 by R. W. Thatcher, whose resignation from the Washington College and Station was recently noted.

Nebraska University.—The contract has been let for a brick building at the university farm which will be 140 feet long, 65 feet wide, and 3 stories high. This building, with equipment, will cost $85,000 and will house the department of agricultural botany on the third floor, the department of entomology and general classrooms on the second floor, and the department of horticulture on the first floor.

New Mexico College and Station.—At a recent meeting of the new board of regents the positions of President W. E. Garrison, Director Luther Foster, and Registrar J. O. Miller were vacated. Prof. F. Garcia was appointed director of the station.

Correspondence courses are being offered in agriculture for teachers and in poultry raising and fruit growing for farmers.

South Dakota Station.—The legislature has appropriated $10,000 for the collection and introduction of additional Siberian alfalfas and $15,000 for the propagation and distribution of hardy strains for the semiarid regions west of the Missouri River. A small appropriation was also made for the manufacture of hog-cholera serum at the station.

Texas College.—Three buildings, totaling in value approximately $400,000, are under course of construction. One of these is the new main building, costing $200,000, which is of reenforced concrete and gray brick.

Wisconsin University.—Eight demonstration trains have recently been sent out over the State for over three months each, reaching during this period over 30,000 people. The trains were of three kinds, taking up, respectively, improved live stock, grains, and potatoes.

The use of the county poor farms as demonstration farms is reported as increasingly popular. An annual demonstration picnic is held at each of these farms, at which the average attendance has arisen from 80 in 1909 to 450 in 1912.

U. S. Department of Agriculture.—Following the appointment, previously noted, of Dr. B. T. Galloway as Assistant Secretary, W. A. Taylor has been promoted to the position of Chief of the Bureau of Plant Industry. L. C. Corbett has been made assistant chief of the bureau, retaining his title of horticulturist, and is succeeded by A. V. Stubenrauch, in charge of the pomological and horticultural work.

In the office of Experiment Stations, C. H. Lane, assistant in agricultural education, has succeeded D. J. Crosby, who is taking up farming in New York. B. W. Tillman, assistant in the department of soils of *Experiment Station Record*, has been transferred to the Bureau of Soils in connection with its soil survey work in Missouri. The vacancy in the department of field crops has been filled by the appointment of G. M. Tucker (Ph. D., Göttingen).

Federal Agricultural Legislation.—Aside from the agricultural appropriation act, a summary of which has been previously given (E. S. R., 28, p. 301), a

number of other provisions of agricultural interest were enacted at the closing session of the Sixty-second Congress.

One of these amended the food and drugs act of 1906, by requiring the labeling of package goods to show the net quantity. Reasonable variations are to be permitted, the limits to be fixed in the same manner as other regulations for the enforcement of the act. The amendment became effective at once, but does not apply to domestic goods prepared or foreign goods imported prior to September 3, 1914.

Another act authorizes the transfer to the State of Texas for the use of the Texas Experiment Station of a portion of the abandoned military reservation at Brownsville. This includes a tract of 320 acres, a portion of which has been used by this Department in its plant introduction work. It is expected that the Texas Station will utilize the land as a substation and that the Department will continue to cooperate in the work undertaken.

The appropriation act for the Diplomatic and Consular Service contained the provisions of the previous year with reference to the International Institute of Agriculture at Rome. This country will, therefore, contribute $4,800 as its quota for the support of the institute, $3,600 for the salary of a member of the permanent committee, and $5,000 toward the translation into English and printing of the institute publications.

Irrigation Legislation in Kansas.—A law recently enacted by the Kansas Legislature provides for a State board of irrigation, consisting of a geologist from the state university, a civil engineer from the agricultural college, and three members to be appointed by the governor for two years and then elected by the people. This board may install a pumping plant in any county donating 40 acres of land for the purpose and may also experiment with pumping machinery, irrigation methods, and crops suitable for irrigation farming. An appropriation of $125,000 is carried by the act.

Another measure provides that counties of less than 50,000 population may by a petition of at least 51 per cent of the resident taxpayers utilize not to exceed $3,500 of the county funds for the purchase of deep-well drilling machinery. This machinery will be the property of the county, but is to be furnished free of charge to individuals paying the salary of the operator.

Forestry at Syracuse University.—The act of 1911 establishing a New York State College of Forestry at Syracuse University provides for carrying on investigations of problems connected with the protection and management of forests and reforestation. A state forest experiment station of 100 acres was established just south of the city of Syracuse in April, 1912. The college is cooperating with the Forest Service of this Department in a study of the woodworking industries of New York, and also with individuals engaged in managing timberlands or in reforestation.

Four and five year professional courses, leading to the degrees of B. S. and M. F., respectively, and one and two year ranger courses, given on the college forest of 1,800 acres at Wanakena, are now offered, and a summer camp will be held on Upper Saranac Lake for the first time during August.

Alpine Laboratory on Pikes Peak.—An account is given in a recent issue of *Science* of the work of this laboratory, which is situated 8,500 feet above sea level, between Manitou, Colo., and the summit of Pikes Peak. Ecological work has been conducted each summer on Pikes Peak since 1899, and the area has now been extensively studied in a fundamental way.

Among the lines of investigation open are (1) the use of quantitative methods of studying habitat and plants; (2) the application of ecological methods and principles to forestry, agriculture, and plant pathology; (3) the study of individual response to habitat, with special reference to the origin

of species; and (4) quadrat study of the development and structure of plant formations. The plan contemplates graduate work primarily, but advanced students in botany or related subjects, such as agriculture or forestry, are to be admitted under certain conditions. It is announced that a summer's work at the laboratory will be accepted as the equivalent of a semester's work for the master's or doctor's degree at the universities of Minnesota and Nebraska.

Industrial Education in Indiana.—According to *Vocational Education*, the first recommendation made by the commission of industrial and agricultural education established by the General Assembly of Indiana, in 1911, is that "the school authorities in cities, towns, and townships be given power to establish and maintain such vocational schools and departments for industrial, domestic science, and agricultural education as their local situation may warrant."

It is also recommended that the "teaching of agriculture in the rural elementary and high schools, industrial work in city and town schools, and domestic science in all elementary schools and high schools be required in such form as may be outlined as a minimum for each by the state board of education," and that wherever the schools of a township have been consolidated a full course in agriculture be offered, modified to meet the vocational needs of the community, and a fair-sized demonstration farm be operated by the school for practical instruction.

Where consolidation has not taken place, the township may provide demonstration plats in connection with each school or a central demonstration farm. Two or more townships should be authorized to combine wherever feasible for such purposes and for the employment of an itinerant teacher.

Industrial Education in Rhode Island.—According to a recent note in *Vocational Education*, state aid for industrial education in Rhode Island was provided in a law of 1912. Towns that establish and maintain, under the approval of the state board of education, day or evening courses in vocational education, including instruction in the principles and practice of agriculture and training in the mechanic and industrial arts, may receive aid to an amount not exceeding one-half the entire expenditure for instruction.

Nova Scotia Agricultural College.—Since the opening of the Nova Scotia Agricultural College at Truro, about eight years ago, the attendance on the regular and short courses has increased from 85 to 450. The main building has been doubled in capacity and a horticultural building, with greenhouses and provision for the entomological department, and a modern horse barn have been erected, and about 40 acres have been added to the farm.

Winter Farm Courses in Maritime Canada.—Ten-day courses were held for the first time on Prince Edward Island, at Charlottetown, from January 27 to February 8. These courses included instruction in live stock, poultry, horticulture, soil cultivation, seed selection, dairying, and home economics for women. Half-fare railway rates were secured for all who attended, and scholarships valued at $5, together with free transportation, were furnished those completing the course satisfactorily.

A Farm for Boy Scouts.—A recent issue of *Country Life* announces that a farm colony for boy scouts has been established at Wadhurst, in East Sussex. An estate called Buckhurst Place was put at the disposal of the Boy Scouts' Association, and comprises a mansion house, which will accommodate about 200 boys, a farmstead, and farm buildings, together with 100 acres of farm and woodland.

The colony is divided into 24 patrols, or groups, of 8 boys each, controlled by a patrol leader. Five acres are allotted to each group of boys, who conduct the farm with the advice of an expert staff. Live stock has been provided, and

a model dairy is an important feature of the school. There are now about 50 boys in residence, and the governing council expect that when the scheme has been well launched the colony will be self-supporting.

Agricultural Instruction in Burma.—A scheme for the establishment of a staff of district vernacular agriculturists has been sanctioned as an experimental measure and six men selected for a nine months' course of training as district agriculturists which ended March 1. Special emphasis was laid on practical agriculture, but instruction was also given in the theory of agriculture, chemistry, the elements of botany and entomology, principles of cooperation, and the general duties of district agriculturists. Twenty students not applicants for the position of district agriculturist were also admitted to the course.

Under the scheme for the development of technical education, school gardening and nature study are to be introduced into the schools of the large Christian Karen community. The local government made a grant of $1,600 for equipment at Shwegyin and Ngaunglebin where school gardens have been started, and instruction in agriculture and nature study is given by two Karens, who were trained at Mandalay. The Karen National Association has offered substantial financial assistance, and the Department of Agriculture is also giving its support. A book on School Gardening has been prepared by E. Thomstone, deputy director of agriculture.

South African Agricultural Scholarships.—The South African Union has offered five Government scholarships to sons of permanent residents of South Africa for study in agriculture abroad. The holders of the scholarships will receive $750 per annum for a period of from three to four years, and will be pledged then to enter the service of the union for not less than three years at a salary of at least $1,500 per annum.

Plant Biology Station in France.—A station for research in plant biology has been established at the University of Poitiers at Mauroc, where a tract of about 75 acres is available. A large laboratory building has been erected and additional laboratories are contemplated. It is announced that special attention will be directed to agricultural problems. Professor Maige, of the university, has been given charge of the work of the new station.

Colonization Association of the Republic of China.—The object of this association is to interest the poor in the cultivation of waste lands by modern methods under efficient direction. A tract of 700 acres near Nankin has been acquired for the establishment of an experiment station for the different colonies organized under the authorization of the association, and in each colony about 200 mow, or 35 acres, are to be reserved for a model farm. All rents paid by the colonists are to constitute a communal fund to be expended for the common good.

Russian Aid to Agriculture.—The estimated expenditures for the Russian Ministry of Agriculture for 1912 are £12,329,349, as compared with £10,729,013 in 1911. There was also available £232,957 for horse breeding. A marked tendency toward individual ownership of land is reported.

The government is endeavoring to encourage poultry farming by granting traveling scholarships on condition that the holders organize special courses of instruction upon their return to Russia.

Agricultural Council of Nebraska.—According to the *Nebraska Farmer* of January 29, a federation to be known as the Agricultural Council of Nebraska was organized recently at Lincoln. It is composed of representatives from each of the agricultural organizations in the State, together with one representative each from the state university, the state conservation commission, and the department of public instruction. The purpose of this council is "to federate for mutual service in matters of mutual interest all organizations

connected with the agricultural development of Nebraska, while preserving the identity and autonomy of individual organizations."

New England Conference on Rural Progress.—The seventh annual session of this conference, held at Boston, March 6 to 9, was attended by about 250 persons, mostly delegates from the various New England organizations connected with rural life, such as the state boards of agriculture, the agricultural colleges and experiment stations, the Grange, dairymen's associations, rural ministers, etc. Special attention was given to the discussion of marketing methods and rural credit problems. J. M. Trueman, of the Connecticut College and Storrs Station, and F. Rasmussen, of the New Hampshire College and Station, discussed the milk situation.

President Butterfield, of the Massachusetts Agricultural College, gave a brief review of the accomplishments of the conference since its establishment and a survey of the needs in the future. One of the principal achievements, in his opinion, has been the fostering of the conviction that New England constitutes an economic unit, as this has led to considerable unity of action along agricultural lines. He advocated securing an inventory of New England's agricultural resources, with a view to demonstrating their great intrinsic importance. The study of agricultural education, farm labor, and the marketing of products were suggested as other projects needing attention.

Dean J. L. Hills, of Vermont, was elected president; J. A. Roberts of Maine, F. Rasmussen of New Hampshire, E. S. Brigham of Vermont, K. L. Butterfield of Massachusetts, Howard Edwards of Rhode Island, and J. M. Trueman of Connecticut, vice presidents; and James McKibben, of the Boston Chamber of Commerce, secretary-treasurer.

Conference on Industrial and Vocational Training for Boys and Girls in Institutions.—Under the auspices of the New York Child Welfare Committee, the second conference dealing with problems relating to the education of dependent and delinquent boys and girls was held in New York City, March 7 and 8.

This conference was devoted more particularly to instruction and training in the trades, but there were numerous incidental references to agricultural education and an evening session in which the only number on the program was an illustrated lecture dealing with agricultural education at the Lincoln Agricultural School, Lincolndale, N. Y., and the Berkshire Farm School, Canaan, N. Y. On the afternoon of the second day there were round-table conferences on home economics, agricultural education, equipment for industrial departments, and industries for crippled children.

The conference on agricultural education dealt particularly with individual projects for boys in institutions and the remuneration of boys for their services in such institutions. It was the consensus of opinion that, so far as possible, individual projects should be provided for, and the boys should be given some pecuniary interest in the yields from these projects. However, it was pointed out that in state institutions it is practically impossible to secure funds to pay students or inmates for their services, and a resolution was adopted by the conference looking to the correction of this difficulty in New York.

Tenth International Congress of Agriculture.—The detailed program of this congress, to be held as previously stated at Ghent, June 8 to 13, is announced as follows:

Section I, Rural Economy.—(1) The relative importance of agriculture, trade, and industry in the various countries, and the measures adopted by public authorities in regard to these three subjects; (2) rural depopulation; (3) the organization of small rural property; (4) agricultural credit; (5)

agricultural cooperation; (6) mutual agricultural insurance; and (7) the organization of the trade in agricultural produce.

Section II, Science of Agriculture, Special Crops, Agricultural Education.—(1) Statistics, object, and importance of agricultural experiment stations, documentary results and their interpretation, the best methods of recording and disseminating the information; (2) agricultural meteorology; (3) communications relating to the principal discoveries in agriculture during the past five years; (4) what has hitherto been the influence of new methods of selection on the stability of varieties of cultivated plants; (5) the cultivation of and trade in hops; (6) viticulture, the establishment of vineyards in northern latitudes, and the cultivation of grapes under glass by means of American stocks for grafting purposes; (7) the extension of instruction in natural science in connection with (a) higher and (b) secondary agricultural education; and (8) the main principles of a well-organized system of primary professional agricultural education.

Section III, Animal Industry.—(1) The basis of classification of the races of domestic animals; (2) does the productive value attributed by Kellner to the principal feeding stuffs agree with practical observations; (3) the zootechnic value of selection; (4) the value of pedigree from the zootechnic point of view; (5) color heredity in domestic animals; and (6) what is the zootechnic value of acquired characters.

Section IV, Rural Engineering.—(1) The application of mechanical energy in agriculture; (2) the clearing of land; (3) dry farming; (4) mechanical and other means for the reduction of manual agricultural labor—comparative investigations; (5) agricultural roads; and (6) territorial agricultural meetings.

Section V, Forestry.—(1) What legislative and financial measures should be taken in order to prevent abuse in the management or the destruction of forests which are of public utility; (2) the best means of preventing forest fires, and of decreasing the damage; does the necessity exist for the formation of mutual insurance societies among the owners of forests; methods of organization; (3) the treatment of ordinary coppice, in view of the reduction in the price of firewood and of bark for tanning purposes; and (4) the production of good seed being of the utmost importance, what measures should be taken to provide sufficient guaranties as regards the collection of and the trade in the seed of trees?

International Association of Tropical Agriculture and Colonial Development.—The third congress of this association is to be held in London in 1914. A British section of the association is being organized to assume charge of the congress.

Miscellaneous.—According to the *Nature-Study Review*, the cities of Los Angeles and Pasadena, Cal., have appointed supervisors of nature study, school gardening, and agriculture in the elementary schools. In Los Angeles there will be half a dozen special supervisors in addition to the chief supervisor.

The Texas Industrial Congress awarded 141 prizes, aggregating $10,000, in the second farm-products competition held under its auspices. There were over 4,000 contestants in 55 counties, largely in demonstrations of crop growing. Among the prizes were 19 scholarships in the state university.

The Fourth International Congress on Home Education will be held in Philadelphia in 1914.

EXPERIMENT STATION RECORD.

VOL. XXVIII. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

On the refractive indexes of solutions of certain proteins.—VI, The proteins of ox serum: A new optical method of determining the concentrations of the various proteins contained in blood sera, T. B. ROBERTSON (*Jour. Biol. Chem., 11 (1912), No. 3, pp. 179–200*).—"The value of a (change in refractive index of a solvent caused by the solution of 1 gm. of protein) for the mixed proteins of ox serum is the same whether the proteins are dissolved in the native serum, or precipitated by alcohol, washed in alcohol, and ether, and dried and dissolved in $\frac{N}{100}$ potassium hydroxid. It is also independent of the dilution and is not altered by acidification of the serum. In [the] experiments the value of this constant for the proteins of ox serum was 0.00195 ± 0.00002.

"[The] results indicate that the refractivity of the mixed proteins of ox serum is equal to the sum of the refractivities of the separate constituent proteins. For refractometric purposes the nonprotein constituents of serum may be regarded as being, substantially, $\frac{M}{6}$ sodium chlorid. The value of a for the albumins of ox serum dissolved in three-eighths saturated or more dilute solutions of ammonium sulphate is identical with its value in distilled water. I find it to be 0.00177 ± 0.00008. The value of a for the albumins of ox serum dissolved in one-half saturated ammonium sulphate solutions is somewhat lower.

"Ox serum does not contain the crystallizable albumin which is found in horse serum. The percentages of the various proteins in ox serum have been determined refractometrically with the following results: 'Insoluble' globulins 0.76 ± 0.04 per cent, 'soluble' globulins 2.34 ± 0.10 per cent, and total globulins 3.10 ± 0.10 per cent; total albumins 5.4 ± 0.1 per cent—total proteins 8.5 ± 0.1 per cent."

Reasons are given for preferring the refractometric method to the methods at present in use for the analysis of serum proteins. A method of procedure for the refractometric analysis of serum proteins is outlined in detail.

The nitrogenous constituents of Boletus edulis fungi, E. WINTERSTEIN and C. REUTER (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 18–22, pp. 566–572*). The alcoholic extract of the dry fungus was found to contain trimethylhistidin and some adenin. The arginin fraction contained a base, $C_9H_{15}N_3O_2$. The

lysin fraction showed the presence of cholin, while the filtrate from the phosphotungstic acid precipitate contained racemic alanin. In the aqueous extracts the same alloxuric bases were noted. The amino acids found were alanin, leucin, and phenylalanin. The chief volatile bases present were ammonia and trimethylamin.

In the alcoholic extract from the fresh fungus trimethylhistidin, cholin, and putrescin were detected. From 2,500 gm. of dried fungus 132 gm. of viscosin was obtained by precipitation with alcohol. The viscosin preparation showed 0.425 per cent of nitrogen and consisted to a very great extent of glycogen. The residue obtained in this method containing chitin, amorphous carbohydrate, and protein was hydrolyzed with concentrated hydrochloric acid. After concentration 20 gm. of glucosamin hydrochlorid was obtained. The mother liquors were fractionated in the usual manner and from 500 gm. of air-dry substance, which contained about 300 gm. of the protein, 130.3 gm. of esters were obtained. In this glycocoll, alanin, leucin, valin, prolin, phenylalanin, asparaginic acid, and glutaminic acid were noted.

Autolyzing tests showed the presence of appreciable quantities of isoamylamin and large quantities of ammonia. Adenin could not be detected in the autolysate, but hypoxanthin and guanin were found, and probably the adenin was converted into hypoxanthin. No cholin was present in the lysin fraction, but on the other hand much putrescin (1.4 diamino butane), which was probably formed from arginin, and indications pointing to the presence of phenylethylamin and p-oxyphenylethylamin, were present.

If sterile air is passed through the autolyzing solutions humus-like masses are precipitated and from these chitosan can be obtained. The formation of nitrogen containing humic acid substances probably plays a part in soil autolysis. The protein in the fungus could not be extracted with a 10 per cent solution of sodium chlorid. The Schmiedeberg-Krakow copper-potassium method, which was used, will not render the carbohydrates soluble but the precipitation of the protein is not complete, due to denaturization.

Some digestion tests made in vitro with pepsin and trypsin are also reported. The approximate chemical composition of the air-dry fungus is as follows: Moisture 10 per cent; ether extract 4 per cent, which consists of fat 3.2 per cent, cholesterol 0.5 per cent, and lecithin; alcohol extract 12 per cent, including trehalose 3 per cent, and sugar. lecithin, bases, amino acids, purin bodies, etc., 9 per cent; extract soluble in water 28 per cent, including glycogen (viscosin) 5 per cent and sugar (trehalose, purin bodies, bases, amino acids, ash, etc.) 23 per cent; and residue 46 per cent, including protein 30 per cent, amorphous carbohydrate (parasodextran) 10 per cent, and chitin 6 per cent.

The enzyms of Linaceæ, J. V. EYRE (*Chem. News, 106 (1912), No. 2758, pp. 167, 168*).—"Work of Armstrong and Horton has shown that the enzym and accompanying glucosid—linamarin—occurring in the wild Java beam (*Phaseolus lunatus*) belong to the β-series, and that the enzymic extract from these beans is practically without action on amygdalin but readily hydrolyzes prunasin and linamarin. Continuing this work it is now shown that this dual activity of linase—as deduced from a study of the active extract of the Java bean—is not due to the activity of a single enzym.

"Study of the Linaceæ has revealed distinct evidence of the presence of a variety of enzyms in the leaf and seed of this species of plant; also, that the proportion in which they occur is subject to considerable variation. From the results found it is not possible to regard linase as being equally active toward linamarin and prunasin; consequently it must be that the extract from the Java bean contains prunase as well as linase. It may well be that linase per se is without action on prunasin.

"During the period of plant growth slight changes in the hydrolytic activity of the flax enzyms toward various glucosids have been observed; a decreased activity toward linamarin, and an increased activity toward prunasin and amygdalin taking place as the season advances. Enzymic activity is found to be correlated with the presence of a cyanophoric glucosid; those species of flax which resemble *Linum usitatissimun* or *L. perenne* in general habit of growth, and which carry blue, white, or red flowers, are more or less richly cyanophoric, whilst the yellow-flowered species, *L. flavum*, *L. arboreum*, *L. maritimum*, etc., which differ in habit from common flax, contain neither enzym nor glucosid.

"The amount of cyanophoric glucosid present in different species is different, and is subject to variation throughout the period of growth. White flowering perennial flaxes invariably contain prussic acid long after its disappearance from the blue-flowered varieties of the same species.

"The development of glucosid and of active enzym in the seed is found to be slow, and the process of ripening, although apparently without much influence on the enzymic activity, occasions a steady decrease in the amount of cyanophoric glucosid present in the seed. Ripe seed are found to contain no cyanophoric glucosid."

Linase and other enzyms in Linaceæ, H. E. Armstrong and J. V. Eyre (*Proc. Roy. Soc.* [*London*], *Ser. B, 85 (1912), No. B 580, pp. 370–378*).—This has been adequately noted in the above abstract.

Cresoltyrosinase, a reagent for peptids, polypeptids, proteins and the cleavage of proteins by micro-organisms, R. Chodat (*Arch. Sci. Phys. et Nat.* [*Geneva*], *4. ser., 33 (1911), No. 1, pp. 70–95; abs. in Chem. Zentbl., 1912, I, No. 13, pp. 1032, 1033*).—The method of producing tyrosinase from potato peelings and its action upon paracresol in the presence of glycocoll and other amino acids, upon polypeptids alone and in the presence of paracresol, and upon proteins is discussed. The author points out that by the coloration produced as a result of tyrosinase activity with the various cleavage products it is shown that native proteins and peptones are in reality polypeptids. Likewise the blue coloration with a red dichroism produced by the initial cleavage products shows without a doubt the presence of tyrosin containing polypeptids (glycyltyrosin), and finally it shows by the black coloration obtained that tyrosin is an end product. Other amino acids, like alanin, can also be detected by the coloration.

The peptids are divided into two classes by this investigator, according to whether the reagent produces only a red coloration or a blue coloration finally.

The distribution of β-enzyms in plants, H. E. and E. F. Armstrong and E. Horton (*Proc. Roy. Soc.* [*London*], *Ser. B, 85 (1912), No. B 580, pp. 363–369, pl. 1*).—The 4 glucosids linamarin, amygdalin, prunasin, and salicin were exposed for 24 hours at 37° C. to the action of the enzyms from the following plants: *Prunus laurocerasus*, *P. amygdalus*, *Laurus lusitanica*, *Aucuba japonica*, *Garrya elliptica*, Laurustinus, *Skimmia japonica*, *Salix rubra*, *Epilobium augustifolium*, *E. hirsutum*, *Gaultheria shallon*, *G. procumbens*, *Arbutus unedo*, *Calluna vulgaris*, *Arctostaphylos uva-ursi*, *Vaccinium myrtillus*, *Castanea sativa*, *Vicia sativa*, *V. cracca V. scpium*, *V. sylvatica*, *V. villosa*, *Lathyrus pratensis*, *L. aphaca*, *Ononis arvensis*, *Medicago sativa*, *Onobrychis sativa*, *Trifolium pratense*, *Galega officinalis*, *Lythrum*, *salicaria*, *Spiræa ulmaria*, *Lotus corniculatus*, *L. uliginosus*, *L. jacobæus*, *Aquilegia vulgaris*, *Thalictrum aquilegifolium*, *Asperula odorata*, *Galium verum*, *Isatis tinctoria*, and *Rubia tinctoria*.

Influence of some antiseptics upon the action of maltase, W. Kopaczewski (*Biochem. Ztschr., 44 (1912), No. 5–6, pp. 349–352*).—The results show that the best antiseptics, which have no influence upon the enzymatic process, are toluol

and chloroform. Mustard oil is shown to have a very strong reducing power and in the presence of Fehling's solution it is decomposed and as a result a black-green precipitate is produced which is insoluble in ferrous sulphate. This fact prevents an accurate determination of the amount of sugar present in the medium. Sodium chlorid, which possessed a slight alkaline reaction toward litmus, showed the greatest maltose formation in concentrations of from 0.4 to 0.5 per cent. The results obtained with formaldehyde substantiate those obtained a long time ago by Bokorny. In the tests with hydrochloric acid and nitric acid it is shown that the introduction of a metallic ion diminishes the inhibitory action of these acids upon the enzyms. The compounds that were used were sodum chlorid and silver nitrate.

Activation and inhibition (paralysis) of zymase and catalase activities, H. VAN LAER (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 18–22, pp. 481–484*).—The method proposed by Lebedeff for obtaining zymase by simple maceration when used with Belgian top yeast yields very active preparations. Malt extract was found to inhibit the autolysis of the coagulable proteins present in the extract, while a solution of papain was found to increase the rapidity of the digestion. While malt extract diminishes the time of maceration it increases the activity of catalase and zymase. Papain increases the activity of zymase but lowers the catalytic activity.

Influence of halogens upon diastatic and proteolytic activity, C. GERBER (*Compt. Rend. Soc. Biol. [Paris], 73 (1912), No. 28, pp. 354–360*).—This is a continuation of some studies previously noted (E. S. R., 27, p. 109) and considers the effect of chlorin and bromin upon the coagulation of boiled and raw milk, and the saccharification of ordinary and soluble starch (Fernbach) by various animal and vegetable enzyms.

The occurrence of levan in sugar, W. G. TAGGART (*Jour. Indus. and Engin. Chem., 3 (1911), No. 9, pp. 646, 647*).—Previously noted from an article by Owen (E. S. R., 25, p. 110).

Determination of dextrose in the presence of nitrogenous bodies, M. ROSENBLATT (*Pul. Sci. Pharmacol., 19 (1912), No. 7, pp. 411–413*).—Dextrose was determined by Bertrand's method, in the presence of glycocol, alanin, leucin, tyrosin, aspartic acid, asparagin, betain, glutamin hydrochlorid, urea, and peptone (Chapoteaut and Witte). High results were obtained in the presence of glycocol and tyrosin, and low results with leucin, aspartic acid, glutamin hydrochlorid, peptone, and alanin. In some instances the errors were negligible.

Method of distinguishing between aldoses and ketoses, M. BETTI (*Gaz. Chim. Ital., 42 (1912), I, No. 3, pp. 288–294; abs. in Analyst, 37 (1912), No. 435, p. 266*).—"The method is based upon the fact that *B*-naphthol-benzylamin forms crystalline compounds of amino-aldehydic character with aldoses, but does not react with ketoses. With *d*-mannose the reagent forms a compound, $C_{17}H_{13}ON:C_6H_{12}O_5$, which crystallizes in white needles melting (with decomposition) at 207 to 208° C.; with *d*-galactose it yields small prisms melting at 206° (with decomposition); with *d*-glucose, white silky needles melting (with decomposition) at 192°, and being more soluble in alcohol than the preceding compounds; and with rhamnose, white crystals melting (with decomposition) at 192°.

"In using the reagent for the separation of dextrose and levulose, a solution of 0.9 gm. of each of the sugars in dilute alcohol was added to a warm alcoholic solution of 2.5 gm. of the base, and the mixture left for 24 hours, and then allowed to evaporate spontaneously. The crystalline mass was triturated with a little water and filtered, and then washed on the filter. The filtrate

and washings contained the levulose. The residue, after being washed with petroleum spirit and crystallized from a large volume of alcohol, melted at 192°, and by treatment with dilute hydrochloric acid yielded the dextrose again."

The organic phosphoric acid of cotton-seed meal, R. J. ANDERSON (*New York State Sta. Tech. Bul. 25, pp. 3–12; Jour. Biol. Chem., 13 (1912), No. 3, pp. 311–323*).—It is shown that cotton-seed meal contains an organic phosphoric acid which is very similar to phytic acid and gives easily crystallizable barium salts. Whether the substance is identical with phytin could not be determined, but when it was heated in a closed tube with dilute sulphuric acid, inosit and phosphoric acid were produced.

"The aqueous solution of the free acid gives all those reactions which have been attributed previously to the presence of pyro- and metaphosphoric acids in cotton-seed meal [E. S. R., 27, p. 611]. The acid when given in 0.5 and 1 gm. doses to rabbits does not show any marked toxic properties. Symptoms of distress were produced but the animals recovered their normal appearance after 2 or 3 hours."

Concerning the organic-phosphoric acid compound of wheat bran, R. J. ANDERSON (*Jour. Biol. Chem., 12 (1912), No. 3, pp. 447–464*).—Previously noted from another source (E. S. R., 28, p. 17).

The purpling chromogen of a Hawaiian Dioscorea, H. H. BARTLETT (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 264, pp. 19, pl. 1, fig. 1*).—A chromogen in the shape of a brown resinous compound, termed rhodochlorogen, was isolated from the air potato (Hawaiian bitter yam) which in dilute neutral or acid solutions is yellowish and forms intensely wine-red solutions on treatment with plant oxidases or weak inorganic oxidents and intensely green alkali salts before and after oxidation.

The chromogen was soluble in alcohol, acetic ether, and chloroform, moderately soluble in ether, and insoluble in petroleum ether and water. It was not possible to obtain it in a crystalline condition.

A second chromogen was also noted in the precipitate obtained when the ammonia-greening chromogen (rhodochlorogen) was treated with lead acetate, dried, triturated with acetic ether, and slightly acidified with acetic acid. By this process a small amount of the precipitate was decomposed. After some further treatment a brown resinous mass was obtained which was similar in appearance to the ammonia-greening chromogen described above. The ammonium salt of the red oxidation product of this preparation is a purple compound insoluble in water and acetic ether.

Both of these chromogens have a similarity to the anthocyanins. "Many investigators have supposed that the anthocyanins were closely allied to the tannins. In this connection it is especially interesting that during the process of purification rhodochlorogen was separated from tannin by the use of lead acetate and ferrous sulphate. Lead acetate did not precipitate rhodochlorogen, but did precipitate its red oxidation derivative . . . There is strong circumstantial evidence that the chromophoric nucleus in the molecules of rhodochlorogen and anthocyanin is identical and therefore that the two substances are in some way genetically related in the plant metabolism . . .

"In regard to the ammonia-purpling chromogen of Dioscorea tubers little can be said. It has been obtained in sufficient quantity for only a few tests and was probably not even approximately pure. It may be pointed out, however, that in its color reaction it resembles some of the nonammonia-greening anthocyanins."

Zygadenin.—The crystalline alkaloid of Zygadenus intermedius, F. W. HEYL, F. E. HEPNER, and S. K. LOY (*Wyoming Sta. Rpt. 1912, pp. 51–57, figs. 2*).—Continuing previous work (E. S. R., 27, p. 881), the authors have now extracted a large quantity of the leaves of *Z. intermedius* and succeeded in isolating a crystalline alkaloid which has been termed zygadenin. It melts at 200 to 201° C. and the formula, $C_{39}H_{63}NO_{10}$, has been assigned to the alkaloid provisionally as the molecular weight determinations are to be duplicated.

"An acid solution of the alkaloid yields a voluminous precipitate with Meyer's reagent, and a beautiful aurichlorate is formed when to the hydrochloric acid solution of the base an acid solution of auric chlorid is added. This salt is soluble in hot water, and crystallizes in elongated, dense prisms upon cooling. It has not yet been analyzed.

"The alkaloid is levorotatory; 0.7028 gm. dissolved in 25 cc. chloroform was found to rotate 2.7° to the left in a 2 decimeter tube. The specific rotation is therefore —48.2°."

Zygadenin crystallizes in orthorhombic blocks from alcohol. The crystals are illustrated.

A chemical investigation of the composition of the oil of chenopodium, E. K. NELSON (*U. S. Dept. Agr., Bur. Chem. Circ. 109, pp. 8*).—In some previous work (E. S. R., 25, p. 506) it was noted that hydrating ascaridole by shaking with ferrous sulphate gives the same glycol that occurs when this substance is carefully heated to 150° C.

By further study it has now been noted that in addition to the glycol two other crystalline substances are formed, one in larger and the other in smaller amounts. One of these substances was designated β-glycol, $C_{10}H_{18}O_3$, and the other is an erythrite corresponding to the formula $C_{10}H_{20}O_4$. "When this 'erythrite' is boiled with dilute sulphuric acid it is decomposed. The products of dehydration have not as yet been thoroughly studied, but a ketone with strong menthone odor and a peculiar crystalline phenolic substance, melting at 80 to 81°, have been separated. The semicarbazone of the ketone melted at 182 to 184° and was difficultly soluble in the ordinary solvents. This melting point is much lower than that reported by Wallach for the semicarbazone of Δ′ menthenone, melting at 224 to 226°, and obtained as a product of dehydration from 1.3.4. trihydroxyterpane, so that possibly this is an isomeric menthenone, or a mixture of isomers. On the basis of the formula proposed by the author for the glycol anhydrid, which is the product formed on heating ascaridole to 150°, it is not easy to account for the formation of the erythrite." On this account it is now proposed to substitute the structural formula proposed by Wallach, who states that it is a 1.4 instead of a 3.6 peroxid. With "this formula, which is well supported by facts, it is easier to account for the fact that the hydration of the rearrangement product leads to the formation of more than one glycol."

Some additional data on the structure of erythrite, etc., are presented in detail. "Chenepodium oil, after being kept for a year at ordinary temperature, increases in gravity and decreases in optical rotation."

The distribution of fluorin in animal and vegetable tissues, and its estimation in minute quantities, G. W. MONIER-WILLIAMS (*Chem. World, 1 (1912), No. 8, pp. 255–257*).—This is a review of the existing methods for the detection and estimation of small amounts of fluorin. A reliable method for estimating traces of fluorin is considered still a desideratum.

A new apparatus for the volumetric determination of carbon dioxid, H. W. BRUBAKER (*Jour. Indus. and Engin. Chem., 4 (1912), No. 8, pp. 599, 600, fig. 1*).—When the Bowser method (E. S. R., 27, p. 805) was tried out by a class

of students some objectionable features were found in the apparatus which could not be overcome unless the operator using the method was skilled. In order to make the method applicable to the use of inexperienced persons a piece of apparatus was devised which is illustrated.

Revision of the methods for the gravimetric determination of magnesium, Z. KARAOGLANOV (*God. Sofiĭskiĭa Univ. (Ann. Univ. Sofia), 7 (1910–11), pt. 2 [Art. 1], pp. 3–57*).—The method for determining magnesium has been improved, and a slight modification made in the sulphate method by which the results obtained agree very well with those obtained by the oxid method The cause of the blackening of the magnesium pyrophosphate precipitate was also studied. When the Gibbs, Schmitz, and Neubauer methods were compared with the oxid and sulphate methods, the highest results were obtained by the Neubauer method, while the Schmitz and Gibbs methods furnished the lowest results. The Pellet method can not be used for quantitative purposes because no magnesium sulphopyrophosphate is produced.

Analysis of sodium arsenate, H. CORMIMBOEUF (*Ann. Chim. Analyt., 17 (1912), No. 5, pp. 161–163; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 597, II, pp. 684, 685*).—The method, which is intended for samples of sodium arsenate for insecticidal purposes, is as follows: "Five gm. of the sample is ignited at a low temperature (in order to destroy the coloring matter which is usually present in the commercial product), and then dissolved in about 150 cc. of water; this solution is titrated with N/1-sulphuric acid, Orange IV being used as the indicator. Let the number of cubic centimeters of acid required be denoted by x. Phenolphthalein is now added, and the solution titrated with N/1-sodium hydroxid solution, the quantity required being expressed by x'. Then the percentage quantity of arsenic oxid present is $x \times 0.115 \times 20$. If the number x is equal to x', the product is dibasic, and the percentage quantity of sodium oxid present is $2x \times 0.031 \times 20$, but if not, the amount of sodium oxid is $[(x \times 0.031 \times 20) + (x' \times 0.031 \times 20)] \times 2$."

Some factors influencing the quantitative determination of arsenic in soils, J. E. GREAVES (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 121–128, fig. 1; Jour. Amer. Chem. Soc., 35 (1913), No. 2, pp. 150–156, fig. 1*).—In order to determine the influence of iron upon the amount of arsenic evolved in the Marsh method tests were made with solutions containing varying amounts of iron and constant amounts of arsenic. Traces of iron were introduced for the purpose of accelerating the action of the acid upon the zinc used in the test. "From the results it may be seen that the arsenic recovered decreases very rapidly as the iron added increases. In fact, the amount retained is almost directly proportional to the amount of iron introduced. Even as small amount as 1 mg. of iron in these tests was sufficient to retain one-fourth of the arsenic, so that even traces of iron must be considered in determining arsenic by the Marsh method."

In accordance with Harkins' suggestion[a] the retaining action of iron can be prevented by the addition of 200 mg. of stannous chlorid. The retaining influence of 1 gm. of iron was found to be neutralized completely by 1½ gm. of stannous chlorid. A soil in which 40 per cent was soluble in hydrochloric acid (specific gravity 1.115) and containing 2 per cent of iron was found to be free from arsenic. This soil was then studied with additions of arsenic, and as a result of this work the following method is recommended:

Ten gm. of soil (where the amount of arsenic in the soils is small larger samples should be used) is weighed into a casserole to which is added 25 cc. of

[a] Jour. Amer. Chem. Soc., 32 (1910), No. 4, pp. 518–530, fig. 1.

concentrated arsenic-free nitric acid and the mixture heated on a hot plate for 30 minutes. While still moderately hot there is added to this 10 cc. of concentrated sulphuric acid and the whole heated for 30 minutes longer. The soil is taken up and thoroughly washed with hot distilled water, the filtrate evaporated to dryness, and heated until free from nitrates. The residue is treated with dilute arsenic-free sulphuric acid to which is added 20 cc. of stannous chlorid solution, 1 cc. of which contains one-tenth of a gram of stannous chlorid. This solution is slowly introduced into a Marsh apparatus, the glass tube through which the hydrogen is conducted being heated by means of an electric combustion furnace. The deposit of arsenic is carefully weighed on fine analytical balances.

By this method very small quantities of arsenic can be accurately determined as is shown by the reported results.

The nitrogen groups contained in peat and the cleavage of ammonia from it through the agency of superheated steam, G. I. RITTMAN (*Izv. Moskov. Selsk. Khoz. Inst.* (*Ann. Inst. Agron. Moscou*), *18* (*1912*), *No. 2, pp. 323–333*).—This is a report of tests in regard to the determination of the various nitrogen groups present in peat. The amid nitrogen was determined by Sachse's method, which, however, was found to work well only for the amino solutions.

The amount of nitrogen split off as ammonia was greatly dependent upon the time of boiling with dilute hydrochloric acid, and the author accordingly found it best to boil for 4 hours. The amount of amid nitrogen found in various peats varied, but was around 15 per cent of the total nitrogen. The quantity of diamino nitrogen depended only slightly upon the time of boiling the sample with dilute hydrochloric acid. Superheated steam split off the ammonia very rapidly at about 300° C. No connection between the nitrogen groups in peat and the amount of ammonia split off by superheated steam was noted. The most ammonia was released from peat obtained in a low moor.

Note on the neutral permanganate method for the availability of organic nitrogen, J. P. STREET (*Jour. Indus. and Engin. Chem., 4* (*1912*), *No. 6, pp. 437, 438*).—Previously noted from another source (E. S. R., 27, p. 205).

A study of the cause of the partial insolubility of potash salts when mixed with basic slag, T. E. KEITT (*South Carolina Sta. Rpt. 1912, pp. 31–36*).—The results of these experiments show that a large part of the potash which when unmixed is soluble in water becomes insoluble when mixed with basic slag. "A determination of the water soluble lime content before and after mixing indicates that there is no interaction between calcium and potassium. By elimination, it appears that there must be a combination in which the iron and potash are involved. The compound is insoluble in hot water, but almost entirely soluble in hydrochloric [acid] of 1.115 specific gravity." If this compound is dissolved there is so much iron present "that it occludes the potash to such an extent that it is necessary to use large dilutions and many reprecipitations to separate the potash."

This investigation will be continued for the purpose of determining the solubility of the hot water insoluble potash in ammonium citrate and citric acid. It is thought that the occlusion of potash by iron probably accounts for the many complaints which are made by mixers that certain goods do not show the amount of water soluble potash that they should and do in other cases.

In addition to this it is to be determined whether there is any relation between the iron content and the content of potash insoluble in water in certain mixtures of acid and potash that were found deficient by the fertilizer control during the past year.

The estimation of potassium, especially in fertilizers, soil extracts and plant ashes, W. A. DAVIS (*Chem. World, 1 (1912), No. 7, pp. 219, 220*).—"In view of the grave errors to which the platinum method is subject, there seems no good reason for longer retaining it, in view of the fact that a more accurate and simple method of analysis exists in the perchloric method. Its abandonment is, moreover, desirable not only on grounds of economy, but as eliminating the vexed question as to the value that shall be chosen for the atomic weight of platinum in potash analyses. In the perchloric acid method the ratios involved are the simple molecular ratios such as $\frac{KClO_4}{KCl}$ or $\frac{2\,KClO_4}{K_2O}$, in which the atomic weights used have all been accurately fixed."

Estimation of nitrates in waters, H. F. KNIGHT (*Chem. World, 1 (1912), No. 7, p. 247*).—Two methods with which the author has had experience are described as satisfactory and simple.

In the first method, the phenol sulphuric acid is replaced by a 1 per cent solution of salicylic acid in sulphuric acid, which may be prepared in a few moments. From 10 to 50 cc. of the water to be tested is evaporated with 1 cc. of the salicylate solution to a low bulk on a water bath, until a thick sirup is obtained. This is then diluted with 10 cc. of water, allowed to stand for a few moments, poured into a Nessler tube with 10 cc. of ammonia or solution of caustic soda, and the depth of the yellow color compared with that obtained by treating in a similar manner known quantities of potassium nitrate. The presence of chlorids does not affect the results, and for most samples 10 cc. is deemed ample for a determination.

The second method "has many points of preference over the former, not the least of which is that it may be directly applied to any water without the preliminary concentration with the reagent, and further the blue color which is produced is more easily matched than the yellow of the former method, and artificial light is just as good as daylight for the purpose. The reagent used may be either diphenylamin or its hydrochlorid, dissolved in pure concentrated sulphuric acid, a suitable strength being about 0.25 per cent, or say 0.5 gm. in 100 cc. of acid. If 1 cc. of the water under test is mixed in a Nessler tube with 3 drops of the reagent and 10 cc. of pure sulphuric acid added, a blue color is produced in degree according to the amount of oxidized nitrogen present, and is compared with the color obtained by using a standard solution of potassium nitrate containing 1 to 2 parts of N_2O_5 per 100,000, the match test being made by taking 0.1 to 1 cc., making the fraction of 1 cc. up to 1 cc. with distilled water, and adding 10 cc. of sulphuric acid as before. . . . In cases where sulphuric acid, free from oxids of nitrogen, is difficult to obtain, then method 1 is to be recommended, as the amount used is only one-tenth of that used in the diphenylamin method."

The value of Eijkman's fermentation test conducted at 46° C. as an aid for examining drinking water, F. H. HEHEWERTH (*Centbl. Bakt. [etc.], 1. Abt., Orig., 65 (1912), No. 1–3, pp. 213–220*).—The method consists of incubating the water in question at 46° C. in a fermentation flask which contains one-eighth of its volume of a sterile aqueous solution containing peptone (10 per cent), glucose (10 per cent), and sodium chlorid (5 per cent). When the *Bacillus coli* is present amongst other organisms it gains the upper hand quickly at this temperature and in 24 hours an almost pure culture is obtained. In the process the fluid becomes cloudy and active fermentation is present.

The author also found that amongst a number of coli strains, all of which were morphologically characteristic and obtained from the intestinal tract of man, only 38.8 per cent fermented glucose (dextrose) at 46° C. Certain differ-

ences were also noted for other carbohydrates, but the greatest variation was with saccharose. The fermentation test conducted in this manner is therefore of no definite value for detecting this organism.

Report of the international committee for food products, A. J. J. VANDEVELDE (*Ghent, 1912, pp. 200*).—This is a report of the committee for the unification of the analytical methods for food products during 1909, 1910, and 1911, and includes the propositions up for discussion at the Eighth International Congress of Applied Chemistry, held at Washington and New York, 1912.

Artificial coloring of food and condiments, E. SPAETH (*Pharm. Zentralhalle, 53 (1912), Nos. 18, pp. 465–473; 19, pp. 496–501; 20, p. 532; 21, pp. 558–564; 22, pp. 595–601; 23, pp. 626–629; 24, pp. 654–658; 25, pp. 685–690; 28, pp. 781–784; 29, pp. 810–813; 30, pp. 840–845; 31, pp. 871–874*).—This is a continuation of work previously noted (E. S. R., 25, p. 712), and includes goods made from flour with and without eggs, viz, egg noodles, biscuits, and cakes, with special reference to the artificial coloring of these products.

The biological methods for detecting horse meat in pork products, G. BLANC (*Ann. Falsif., 5 (1912), No. 44, pp. 274–281*).—This is a discussion in regard to the value of the precipitin method for detecting horse meat which has been added to pork products.

In using this reaction it is absolutely necessary when making comparative tests to use the same antiserum, i. e., a serum of practically the same titer. Antiserums may be obtained which will give a reaction in 1 : 20,000 for preparations containing 5 per cent of added horse meat, but this is a rare occurrence. The average sera, however, oscillates in the neighborhood of about 1 : 10,000.

The determination of total solids in potatoes, H. BJÖRN-ANDERSON (*Ztschr. Analyt. Chem., 51 (1912), No. 6, pp. 341–359, pl. 1*).—Previously noted from another source (E. S. R., 25, p. 109).

An investigation of some important methods for examining honey, J. FIEHE and P. STEGMÜLLER (*Arb. K. Gsndhtsamt., 40 (1912), No. 3, pp. 305–356, fig. 1*).—The gravimetric methods are considered the only ones which will furnish accurate results for the total solids in honey. For the indirect determination of total solids Windisch's cane sugar table is recommended, but in any event it will yield only approximate figures. For the determination of free acids sensitive blue litmus paper should be chosen as the indicator. As formic acid has not been definitely found in honey it is advisable to report the results obtained in cubic centimeters of normal alkali. The alkalinity of honey ash can be determined in conjunction with the titration for the phosphates. The phosphates are valuable for judging the quality of honey.

In determining sugar by Fehling's solution it is optional whether the copper is weighed in the metallic state or as oxid. Saccharose can be best determined gravimetrically, as the polarimetric method yields only approximate results. For the detection of artificial invert sugar Ley's method is of no value, whereas Fiehe's reaction on the other hand, especially in conjunction with the enzym test, is very valuable for this purpose, as well as for detecting starch sirup and glucose (dextrose) in honey. For detecting honeys heated to over 85° the diastase method is a positive test. Precipitation of proteins according to the Lund method is of no value.

Determination of sugar in sweetmeats and sirups, CROCHETELLE and MILON (*Rev. Chim. Indus., 23 (1912), No. 266, pp. 37–39*).—By using the formula

$$g=\frac{198\,R+100\left(Di-\frac{46.5\,S}{100}\right)}{303}$$

the amount of glucose present in the sample under observation can be determined. In this formula *R* equals the amount of reducing sugars present as determined by means of copper hydroxid, *Di* the deviation in rotation after inversion, and *S* the sucrose as determined by Clerget's formula. Levulose is estimated by subtracting the percentage or amount of glucose from that of the reducing sugars found.

Determination of sugar in beets by hot aqueous digestion, E. SAILLARD (*Rev. Gén. Chim., 15 (1912), No. 4, pp. 64–66*).—A discussion of the accuracy of this method and the factors which influence the results obtained with it. The method is deemed satisfactory.

Analysis of beeswax and carnauba wax.—Determination of hydrocarbons, A. LEYS (*Jour. Pharm. et Chim., 7. ser., 5 (1912), No. 12, pp. 577–588; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 13, p. 649*).—"Ten gm. of the wax is boiled for 20 minutes with 25 cc. of alcoholic potassium hydroxid (45 gm. per liter of absolute alcohol) and 50 cc. of crystallizable benzene, in a flask with a tube and tap at the side, so that it can also serve as a separating funnel. An addition of 50 cc. of hot water is then made, and the heating continued for about 10 minutes under a reflux condenser, after which the contents of the flask are allowed to separate into layers, and the boiling lower alcoholic soap solution is drawn off. The benzene is heated with 50 cc. of water beneath a reflux condenser, the water drawn off as before and the benzene containing a mixture of alcohols and hydrocarbons is evaporated in a basin. The residue is now treated with 100 cc. of hot amyl alcohol, added in several portions, each of which is transferred to a flask, and the whole is heated on an asbestos plate while 100 cc. of concentrated hydrochloric acid is added with continual stirring until the mixture has become completely fluid.

"This mixture of acid and amyl alcohol effects a separation of wax alcohols and hydrocarbons on cooling. The hard top layer which separates on cooling is dissolved in a mixture of 25 cc. of amyl alcohol and hydrochloric acid and the solution again cooled, the cake of hydrocarbons then being removed, pressed between filter paper, heated on the water bath in a tared basin, and weighed. The alcohols remaining in the lower layer are heated with a large excess of water and cooled, the lower layer of diluted hydrochloric acid is drawn off, the amyl alcohol solution of the wax alcohols is evaporated on the water bath, the residue taken up with benzene, the solution evaporated, and the final residue weighed.

"Two samples of pure beeswax thus examined yielded 10.44 and 13.03 per cent of hydrocarbons and 39.21 and 39.6 per cent of alcohols respectively, while a sample of carnauba wax gave 49.22 per cent of alcohols, but no hydrocarbons. Further information may be obtained by determining the liquid fatty acids, separated by treatment of the lead salts with benzene. In the case of the two samples of beeswax mentioned, the amounts calculated as oleic acid were 8.4 and 8.52 per cent, respectively."

Edible vegetable oils and fats, G. HALPHEN (*Huiles et Graisses Végétales Comestibles. Paris and Liege, 1912, pp. VIII+498, figs. 16*).—This work deals with the chemical changes taking place in vegetable oils and fats, preparation of samples for analysis, detecting and determining foreign substances, chemical and physical properties of vegetable oils and fats, and special chapters on olive, peanut, cotton seed, rape, nut oil, cotton-seed oil-margarin, sesame, and cocoanut oils. The laws in regard to the sale and consumption of vegetable fats and oils for France are also included.

Methyl alcohol, vinegars, etc., L. CALVET (*Alcool Méthylique Vinaigres. Paris and Liege, 1912, pp. 367, figs. 11*).—This publication deals with the meth-

ods of examining denatured alcohol and of preparing methyl alcohol and vinegars of various kinds, and discusses different kinds of acetates and acetone. The laws relating to the sale of the above substances are also considered.

A new use for potatoes, H. C. PRICE (*Sci. Amer., 107 (1912), No. 1, p. 8, figs. 3*).—This is a popular description of the potato drying industry as carried out in Germany. Some of the drying machines are pictured, and the advantages of the systems mentioned are discussed.

Manufacturing casein in Denmark by cooperative institutions (*Mælkeritid., 24 (1911), No. 48, pp. 1027–1039; abs. in Milchw. Zentbl., 41 (1912), No. 7, pp. 219–224*).—Descriptions are given of methods for the preparation of dried casein by acid (lactic, sulphuric, hydrochloric or acetic) and with rennet.

The majority of factories in Denmark produce a casein product with acidified whey. On the average 100 lbs. of skim milk will yield about 3 lbs. of casein and 90 lbs. of whey. The cost of production under Danish conditions is discussed in detail.

Some further investigations in regard to the micro-organisms present in fermenting tea, W. STAUB (*Bul. Jard. Bot. Buitenzorg, 2. ser., 1912, No. 5, pp. 56*).—Under normal conditions micro-organisms (yeasts and bacteria) do not influence the time of fermentation of tea. If during the various stages of the process a pure culture of yeast is added the finished product is not appreciably improved. Bacteria when added in large amounts destroy both the tea leaves and the yeast. Two strains of bacteria were isolated in this work, one from a normal fermenting tea and another from a tea undergoing abnormal retarded fermentation.

An examination of the oleoresins of some western pines, A. W. SCHORGER (*U. S. Dept. Agr., Forest Serv. Bul. 119, pp. 36, pl. 1, figs. 4*).—This is a chemical study of the oleoresins of the western yellow, digger, sugar, lodgepole, and piñon pines, in connection with tapping experiments previously noted (E. S. R., 28, p. 146).

"With the exception of the digger pine, the volatile oil from all the species examined consists of terpenes ($C_{10}H_{16}$), and the sesquiterpenes ($C_{15}H_{24}$). The oil from the digger pine consists of the hydrocarbon heptane (C_7H_{16}), a normal constituent of petroleum."

The chemical and physical constants of the various rosins obtained from the species examined, as well as the constants of a commercial rosin, are given. Some comparisons were also made with an average gum turpentine which consists of a mixture of the volatile oils of the Cuban pine and the longleaf pine.

The methods used in the investigation are described in detail.

Wood turpentines, L. F. HAWLEY (*U. S. Dept. Agr., Forest Serv. Bul. 105, pp. 69, figs. 54*).—This investigation was carried on at the Forest Products Laboratory maintained by the Forest Service of this Department at the University of Wisconsin. The crude wood turpentines were considered from the standpoint of analysis, refining, and composition.

Pulp and paper and other products from waste resinous woods, F. P. VEITCH and J. L. MERRILL (*U. S. Dept. Agr., Bur. Chem. Bul. 159, pp. 28*).—The results of a study, made to show that a combination of the pulp, paper, turpentine, and rosin oil industries would make a logical and profitable industrial condition, are reported. The experiments were conducted with what is known in the South as "lightwood," which is longleaf yellow pine that has lain in the forest until all the sap wood has decayed, leaving the heart wood sound.

It was found that from 4,000 lbs. of cord air-dry wood, equivalent to 3,200 lbs. of moisture-free wood, a total of $48.17 worth of material can be obtained, as follows: Refined wood turpentine, 6 gal., at 40 cts., $2.40; pine oils, 7 gal. at

35 cts., $2.45; rosin spirits, 11 gal. at 20 cts., $2.20; rosin oils, 40 gal. at 35 cts., $14.00; phenoloids, 12 gal. at 6 cts., 72 cts.; crude methyl alcohol, 3.5 gal. at 35 cts., $1.20; and unbleached pulp, 1,440 lbs., at 1¾ cts., $25.20.

The products were of good quality. "The wood turpentine, pine oils, and rosin spirits are suitable paint and varnish thinners, especially for outdoor work; the rosin oils are suitable for making greases; the phenoloids are used for shingle stains and preservatives; and the pulp for making a good strong brown wrapping paper quite similar to that now selling from 3 to 4 cts. per pound."

The detection of faulty sizing in high-grade papers, C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Circ. 107, pp. 3, pls. 3*).—The test described was devised for the purpose of differentiating between the relative values of the sizings of papers, which methods now in use fail to detect.

"The test consists in drawing a strip of paper over the surface of an iron tannate ink and allowing it to drain and dry naturally. Upon examining this inked surface with a magnifying glass it will be found that a well-sized paper will show no indication of the fiber having absorbed the ink, and the entire surface will be uniformly and lightly colored. . . .

"Sizings may be further differentiated by rubbing the surface of a paper with an ink eraser, brushing off the loose particles, and proceeding as directed. A paper which is well sized through will still be uniformly colored and the fibers will take the ink but little.

"The test is valuable in showing the faults of mill practice, especially as to whether in the sizing of high-grade papers the best results obtainable are being procured."

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1912 (*U. S. Dept. Agr., Bur. Chem. Circ. 108, pp. 18*).—This material has been substantially noted from another source (E. S. R., 27, pp. 495).

METEOROLOGY—WATER.

The climatic limits of wheat cultivation, with special reference to North America, J. F. UNSTEAD (*Geogr. Jour., 39 (1912), pp. 347–366; abs. in Jour. Bd. Agr. [London], 19 (1912), No. 9, pp. 742–749, fig. 1*).—This paper presents the climatic requirements for wheat culture and the possible limits of its extension, particularly the northern limits. It gives the accumulated and mean temperatures and duration of light for a considerable number of places in the representative wheat-growing regions of the world, and presents a diagram prepared from these data which shows the relation between the accumulated temperatures and the index numbers of mean temperature plus mean duration of darkness during the periods of growth, from which it is possible to determine whether wheat can be grown at a given place provided the necessary data for temperature and duration of light are known.

The paper also discusses the rainfall requirements of wheat, and on this basis defines two types of wheat-growing country, "(1) that with a relatively mild winter with rain in the cooler parts of the year, where the grain is sown either in autumn or spring, and ripens before the hottest parts of the summer; and (2) that with a more extreme climate with rain during the hotter part of the year, where the grain may perhaps be sown in the autumn, but is more commonly sown in spring, and in either case grows during the spring and summer, ripening at almost the hottest part of the year."

Applying these studies of temperature and rainfall as related to wheat growing, the author concludes that an enormous extension of the wheat-growing area is possible. "With regard to wheat production in North America, two facts,

however, are clear, first, that the total acreage will be very much greater than it is at present, since it may be extended into the colder regions in Canada, and into the drier regions both in Canada and in the United States; second, that the yield per acre on the lands at present cultivated will increase as a result of scientific investigation and its application by farmers. Although the yield on the semiarid lands is likely to be less than on the better-watered lands, even this lower yield may exceed the average yield of the present time. Hence a production double that of the present is quite possible as far as the physical conditions are concerned."

The relation of forests and mountains to the conservation of snow, J. E. CHURCH, Jr. (*Met. Ztschr., 30 (1913), No. 1, pp. 1–10, pls. 2, figs. 9*).—This is an account of studies by the Nevada Experiment Station which have been more briefly reported elsewhere (E. S. R., 27, p. 617).

Meteorological summary for the year 1911, J. F. WILSON (*Wyoming Sta. Rpt. 1912, pp. 75–78*).—Monthly summaries are given of observations at Laramie, Wyo., during 1911 on temperature, pressure, precipitation, humidity, sunshine, cloudiness, and wind movement. A record of soil temperature at depths of 3, 6, 12, 24, 36, and 72 in. during 1911 is also given.

The highest temperature was 86° F., August 31; the lowest, —26°, January 2. The total precipitation was 9.93 in. The lowest relative humidity was 21 per cent, July 9. Light frosts occurred August 3 and 28, a killing frost August 25. The greatest velocity of wind (southwest) was 60 miles per hour, January 7.

Water: Its purification and use in the industries, W. W. CHRISTIE (*New York, 1912, pp. XI+219, figs. 79*).—This book, intended to be helpful "not only to engineers but also to students," deals with sources, impurities, tests, and uses of water; cold and hot softening processes; filtration, aeration, and sterilization; purification of water for drinking purposes; measurement of water; and treatment of boiler waters. A number of "tables of value to users of water for manufacturing and industrial purposes" are included.

Industrial sterilization of water with ultraviolet light, M. VON RECKLINGHAUSEN (*Gesundhts. Ingen., 34 (1911), No. 9, pp. 166–169, figs. 4*).—The principles of this process are explained, the apparatus used is described, and tests with a Westinghouse sterilizer, using a mercury vapor lamp, are reported.

With this apparatus, using a 3-ampere, 220-volt lamp, water was quite thoroughly sterilized at the rate of 600 cubic meters per day (24 hours). *Bacterium coli* was completely destroyed by the treatment and other germs were largely killed. There was, however, a slight increase in molds after the treatment, which is attributed to the way in which the apparatus was installed and may be overcome by a different arrangement. Nevertheless the treatment converted water which was considered unfit for drinking purposes into water which would be classed as of superior quality.

The relative manurial value of Nile water and sewage, A. LUCAS (*Cairo Sci. Jour., 7 (1913), No. 76, pp. 1–9*).—The author quotes analyses by Mackenzie showing that the flood silt of Nile water contains 0.16 per cent of nitrogen and 0.25 per cent of phosphoric acid and that the water contains in solution 1.6 gm. of nitrogen and 3.5 gm. of phosphoric acid per cubic meter. The average sewage of several small disposal works was found to contain 50.25 gm. of nitrogen per cubic meter.

This sewage may be considered "as Nile water enriched with the special plant foods that are deficient in the soil and that are required by the crops. In a rainless climate, such as that of Egypt, the application of the sewage to the land forms an ideal method of disposal. Sandy soils, such as those of the Cario and Port Said sewage farms, which are in special need of nitro-

gen and other manurial constituents, are preeminently fitted for sewage disposal. In the process of applying sewage to the land, not only does the land benefit enormously but at the same time the sewage is effectually purified."

One solution of the sludge problem, A. HINDLE and P. H. WHITAKER (*Surveyor, 42 (1912), Nos. 1072, pp. 163–165, fig. 1; 1073, p. 207*).—A method in which layers of straw and sludge are alternately laid down in the sedimentation tank is described. It is stated that in this way a peculiarly valuable fertilizer is obtained.

Sewage treatment: Advantages of land over artificial schemes, J. MANLEY (*Jour. Roy. Sanit. Inst., 34 (1913), No. 1, pp. 53–59*).—This article cites statements by various authorities and refers to sewage-disposal works, giving results of successful land treatment of sewage.

SOILS—FERTILIZERS.

The practical classification of soils, E. O. FIPPIN (*Proc. Amer. Soc. Agron., 3 (1911), pp. 76–89, fig. 1*).—The author discusses briefly the history and principles of soil classification and presents a scheme of organization of the different factors which have been used in the classification of soils, particularly as developed by the work of the Bureau of Soils of this Department.

According to this scheme soils are classed by (1) region (temperature) as temperate, subtropical, and tropical; (2) section (humidity) as humid, semiarid, and arid; (3) division (mode of formation) as sedentary and transported; (4) province (mode of formation) as residual, cumulose, gravity (colluvial), water, ice (glacial), and wind (eolian); (5) group, as source of materials; (6) series, as color, organic matter, drainage, lime content, and special chemical properties; and (7) type, as texture and structure.

It is thus seen that the basis of the proposed classification is the climate and the geological formation. "The scheme is, therefore, genetic and in its broader lines purely geological."

The volumetric composition of cultivated soils, T. BIÉLER-CHATELAN (*Internat. Mitt. Bodenk., 2 (1912), No. 4, pp. 343–350, figs. 5; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2595–2600*).—The author proposes a method of physical analysis of soils on the basis of their relative proportions of mineral soil particles, water, and air per definite volume of soil.

It is believed that the method is of more practical value than the usual mechanical analysis in that it gives a clearer insight into the physical constitution of a soil in its undisturbed state.

General characteristics of the morphology of soils according to zones and their variations, G. TUMIN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 3, pp. 321–353, figs. 16; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 10, pp. 2130–2132*).—The author regards the soil as a complex of horizons, each derived from a distinct rock formation by the intermingling of humus with the rock material (so-called "humofixation") and the decomposition of the rock minerals by the humus (so-called "humofixation"). Soils having horizons of the same characteristics constitute a morphological type. On the basis of such characterization of horizons, the author presents a scheme of classification of the podzol, chernozem, and alkali soils of Russia.

Alkali soils and their utilization in dry farming, F. COUSTON (*Bul. Agr. Algérie et Tunisie, 18 (1912), Nos. 16, pp. 373–385, fig. 1; 17, pp. 401–412, fig. 1*).—The author reports a study of the distribution, formation, character, and utilization of the alkali soils of the Department of Oran, Algeria.

These soils cover an area of approximately 2,470,000 acres and are divided naturally into those of the upper plains and those of the lower plains. The soils of the upper plains are not irrigated, and the salt content is due to capillary rise of the water from below. The soils of the lower plains are irrigated, and it is pointed out that irrational application of the water has greatly increased their salt content. Sodium chlorid is the principal salt constituent.

The author holds that the nonirrigated soils of the upper plains can be best utilized by dry-farming methods, which reduce evaporation of moisture to a minimum and thus prevent accumulation of alkali at the surface of the soil. The lower plains soils may be benefited by more careful use of irrigation water and by incorporation of organic matter to improve the physical condition of the soil and reduce the amount of irrigation water required.

The soils and agricultural resources of Robertson County, Tenn., R. F. ROGERS (*Resources Tenn., 2 (1912), No. 12, pp. 442–457, figs. 2*).—This is a brief account of a soil survey of this county conducted by the state geological survey in cooperation with the Bureau of Soils of this Department, and describes the different soil types and agricultural conditions of the region.

The soils are of two general classes, residual and alluvial. The residual soils are derived from the impure and fossiliferous limestones known as the Lithostrotion bed or St. Louis limestone. They are silty in texture and of a red and gray color. The soils produce an excellent grade of export tobacco.

[Soils of the Yamethin District, Burma], A. MCKERRAL ET AL. (*Dept. Agr. Burma, Agr. Surveys, 1912, No. 3, pp. 32, pl. 1*).—Chemical analyses of a large number of samples of the different soil types of the region are reported, and the distribution and agricultural characteristics of the soils are briefly discussed.

[Analyses of Queensland soils], J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1911–12, pp. 58, 59, 63–72*).—Mechanical and chemical analyses of soils from the experimental plats of the state farm and from different districts of the State, and soil moisture determinations at various depths and under different methods of cultivation, are reported.

The soils vary from sandy to stiff clay types. Phosphoric acid is the limiting element of plant food.

The well cultivated soil not only absorbed the rain much more readily, but also held "the moisture much better during spells of dry weather."

Temperature observations in the soil on fallow, grass land, and under field crops, W. NAEGLER (*Sächs. Landw. Ztschr., 60 (1912), No. 49, pp. 658, 659*).—Observations at Breslau, Germany, on the temperature of the soil to depths of 120 cm. (about 47 in.) and of the air immediately above the soil on loamy clays with sandy subsoil in fallow and grass lands and land growing barley, turnips, and potatoes are reported.

The results in general show that the temperature of the air immediately above the soil was considerably higher for the land growing the different crops than for the fallow land. The temperature of the grass land was lower than that of the cropped land and higher than that of the fallow.

Colloid chemistry in the study of soils, K. K. GEDROĬTS (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 3, pp. 363–420, fig. 1*).—The author reports a study of (1) the amount of colloidal substances in soil solution, (2) the formation of sodium carbonate in soils, and (3) alkali soils (those containing sodium carbonate) and saline soils (those containing sodium chlorid and sodium sulphate).

The combined organic and mineral colloid content of the soil solution, except in alkali soils, was very small, the amount varying between 0.0018 and 0.02 gm. per 100 gm. of soil. The author therefore questions the correctness

of the theory that the action of freezing, drying, and addition of lime and other fertilizers on the relation of the soil to water and on other physical properties of the soil is due to the coagulation of the sols of the soil solution.

The colloid content of the alkali soils varied between 0.099 and 0.4494 gm. per 100 gm. of soil.

From a study of water extracts of typical alkali soils and of soils to which various salts were added, the author concludes that sodium carbonate is not formed in the soil by direct reaction between sodium chlorid and calcium carbonate, but that the soda of the chlorid replaces other bases (potash, lime, and magnesia) in humates and silicates, and the latter give up soda to the soil solution when the excess of soluble sodium salts is removed. Sodium sulphate to a large extent acts in the same way as sodium chlorid. It results from this that when the proportion of sodium chlorid and sodium sulphate is sufficiently reduced in a saline soil the latter is converted into an alkali or soda soil. Therefore, leaching alone is not likely to be of value in improving alkaline and saline soils, but tends to favor the formation of sodium carbonate.

Regarding the exchange of bases in cultivated soil, G. Wiegner (*Jour. Landw., 60 (1912), Nos. 2, pp. 111–150, pls. 2; 3, pp. 197–222, fig. 1; abs. in Chem. Zentbl., 1912, II, No. 15, p. 1306; Chem. Abs., 6 (1912), Nos. 17, p. 2477; 22, p. 3304; Jour. Chem. Soc. [London], 102, (1912), No. 600, II, p. 891*).—The author reviews in considerable detail the work of others bearing on this subject, and reports a study of the exchange of bases which occurs when molecular equivalents of silicate gels, having an average composition of 42.66 per cent SiO_2, 0.35 per cent CO_2, 19.95 per cent Al_2O_3, 8.68 per cent CaO, 5.47 per cent K_2O, and 22.86 per cent H_2O were shaken up with ammonium chlorid at intervals for 48 hours, the resulting solution being filtered and analyzed.

It was found that there was an absorption of ammonium with an exchange of calcium and potassium ions of the silicate gel in amounts almost exactly equivalent to that of the ammonium absorbed. The anions remained undisturbed as long as there were no secondary reactions. True equilibrium was established at 20° with great rapidity. The influence of temperature upon the equilibrium was very small, rise in temperature causing a slight decrease in absorption. The degree of fineness of the silicate had but little influence upon absorption. Dehydration lessened absorption. The loss of the first 12.6 per cent of water was almost without influence, but with a further loss the ability to absorb rapidly approached zero.

The author considers the reaction a chemical one when regarded as an exchange of equivalents. On the other hand, it showed all the characteristics of a so-called absorption reaction as interpreted by Freundlich and indicated, in the author's opinion, an adsorption of cations due to electrostatic causes with displacement of an equivalent quantity of cations from the gel.

With various concentrations of the NH_4 ions up to saturation, the displacement in the hydrated amorphous silicate gel was in close accord with the equations for adsorption reactions. The most applicable of the adsorption equations is $\frac{x}{m}=B.\ c\frac{1}{p}$ (in which $\frac{x}{m}$ =the amount of cation adsorbed from 1 gm. substance; c, the concentration of the cation in equilibrium; and B and $\frac{1}{p}$ are constants.

The author also reviews investigations on the exchange of bases in the soil and concludes that the relations are the same for the soil as for the silicate gel used in his experiments. In all experiments in which one kind of cation was used, the value of $\frac{1}{p}$ was approximately 0.4.

The absorption of phosphoric acid through zeolites (permutite), S. GRAF ROSTWOROWSKI and G. WIEGNER (*Jour. Landw., 60 (1912), No. 3, pp. 223–235; abs. in Chem. Zentbl., 1912, II, No. 15, pp. 1306, 1307; Chem. Abs., 6 (1912), No. 22, pp. 3304, 3305*).—There was found to be no absorption of the phosphate ion by potassium permutite from a carefully neutralized solution of monopotassium phosphate. The authors conclude, therefore, from the similarity as to constitution and stability of the potassium permutite and the aluminum hydroxid silicic acid gels of the soil that fixation of phosphoric acid in the soil through the latter must be due in large measure only to secondary reactions with previously exchanged cations which form insoluble phosphates.

The law of minimum, A. MAYER, E. A. MITSCHERLICH, and T. PFEIFFER (*Landw. Vers. Stat., 78 (1912), No. 1–2, pp. 115–132*).—Three controversial articles on the subject. See also a previous note (E. S. R., 27, p. 721).

The law of minimum, H. RODEWALD (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 247–252*).—A continuation of the discussion noted above.

Colloid-chemical investigations of humus substances.—I, Investigation of sphagnum peat, S. ODÉN (*Ark. Kemi, Min. och Geol., 4 (1912), No. 3, Art. 24, pp. 18*).—This is a detailed report on a series of researches undertaken with the object of separating the colloidal and noncolloidal substances of sphagnum peat, a brief account of which has already been noted (E. S. R., 27, p. 322). The author's results do not bear out Baumann and Gully's conclusion (E. S. R., 23, p. 715) that all phenomena observed with humus substances may be referred to colloidal action and that humic acids do not exist.

Critical considerations regarding humus acids, humus, and humus soils, H. SÜCHTING (*Fühling's Landw. Ztg., 61 (1912), No. 14, pp. 465–487*).—The author summarizes the present status of information on the character and functions of humus substances in the soil, and gives a critical review of the investigations on this subject by Baumann and Gully (E. S. R., 23, p. 715) and by Tacke and the author (E. S. R., 26, p. 720).

Some experiments regarding the physiological significance of humus substances of the soil, G. A. RITTER (*Internat. Mitt. Bodenk., 2 (1912), No. 4, pp. 301–311*).—This is a summary of a series of experiments to determine the physiological effect of humus substances on the bacterial activity of the soil, particularly as regards the stimulating effect of the iron in the humus as shown by the work of Remy and Rösing (E. S. R., 25, p. 723).

It is stated that the humus substances of the soil, at least in their purified state, are not strictly sources of food for the soil bacteria. The action of the humus substances was at times stimulating and again retarding. The beneficial action is thought to be due to by-products of the raw humus bodies. The compound which causes the stimulation evidently disappears during the process of purification of the humus acids. The activating substances are insoluble in water.

Decomposition of the nutrient (peptone) solution was increased by additions of large amounts of humus acid, and this lends support to the theory that the iron is the stimulating agent in that it serves as a carrier of oxygen. Denitrification was depressed by increased additions of humus. The biological stimulation is thought to be due to the water insoluble but acid soluble by-products of the humus substances.

The physiological stimulation was as great from applications of purified humus acids as from relatively large applications of calcium carbonate. The combined application of humus acids and calcium carbonate produced no noteworthy further stimulation over that produced by either the one or the other of these compounds alone. The physiological rôle of the humus acids therefore can not be regarded in the main as that of an acid.

The organic constituents of soils, O. SCHREINER (*U. S. Dept. Agr., Bur. Soils Circ. 74, pp. 18*).—This is an address given at the symposium on soils at the Washington meeting of the American Association for the Advancement of Science, in which the author discusses the relation of the organic constituents of the soil to plant growth on the basis of investigations reported in detail in bulletins of the Bureau of Soils.

Toxic effects of "alkali salts" in soils on soil bacteria.—III, Nitrogen fixation, C. B. LIPMAN and L. T. SHARP (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 25, pp. 647–655, fig. 1; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 602, II, p. 1200*).—This is the third communication on this subject, previous papers (E. S. R., 27, p. 124) having dealt with the effect of alkali salts on nitrification and ammonification. A modified form of the Gunning method for nitrogen determinations in soils is described and recommended for general use in soil work.

The results show that "sodium chlorid is toxic to nitrogen-fixing organisms in soil at a concentration of 0.5 to 0.6 per cent of the dry weight of the soil; sodium sulphate does not become toxic until a concentration of about 1.25 per cent is reached under similar circumstances; sodium carbonate is the most toxic of the 'alkali salts' tested for nitrogen-fixing organisms, a concentration of 0.4 per cent to 0.5 per cent being sufficient to inhibit nitrogen fixation.

"Unlike their effects on other forms of soil organisms . . . the effects of the 'alkali salts' are relatively only slightly toxic to nitrogen-fixing organisms, but the toxic point manifests itself much more sharply" than it does for ammonifying and nitrifying organisms.

"It would seem possible . . . that, with a sufficient amount of organic matter as a source of energy, nitrogen fixation could go on in soils containing a relatively high salt concentration. . . .

"Sodium chlorid is less toxic for nitrogen-fixing organisms than for either ammonifying or nitrifying bacteria. Sodium sulphate is likewise much less toxic for the first group than for the other two; sodium carbonate is much more toxic for nitrogen-fixing than for ammonifying organisms, but not nearly as toxic as it is to nitrifying organisms.

"While the toxicity of the salts in question does not manifest itself until very considerable concentrations are reached, no stimulating effect has ever been noted at any concentration. . . .

"It would appear that the nitrogen-fixing organisms behave physiologically very much more like alkali-resistant plants than they do like other forms of soil organisms."

Experiment in inoculation of lucern, A. V. DONNAN (*Agr. Gaz. N. S. Wales, 23 (1912), No. 11, pp. 953–958*).—Preliminary experiments to determine the value of different methods of inoculation of lucern seed and soil, alone and combined with applications of lime and complete fertilizers, are reported. The soil was a well drained, red sandy loam and had been used in a continuous manurial experiment until 1907. Since that time the cropping and fertilizer systems were varied.

It was found that the efficiency of the different methods of inoculation was in the following descending order: "(1) Inoculation of soil with soil of same composition, (2) inoculation by watering soil after germination, (3) inoculation by watering soil before sowing, (4) inoculation of soil with soil of dissimilar composition, (5) seed inoculated with lucern Rhizobia, and (6) seed inoculated with vetch Rhizobia.

"Lime applied to plats caused an enormous increase in the number of plants with nodules, and also increased the number of nodules per plant. Where, how-

ever, no lucern Rhizobia were introduced, the presence of lime caused practically no difference.

"Complete manure did not, on the totals throughout, increase the number of nodules, although an increased growth of both stem and root was caused by its application."

Changes which take place in the soil as a result of plant growth and fertilization, J. G. MASCHHAUPT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1912, No. 12, pp. 48–71, pls. 8*).—Pot experiments to determine the effect of growth of plants (potatoes, wheat, and oats) and applications of sodium nitrate, ammonium sulphate, and ammonium nitrate on the rate of settling of the clay particles of a light sandy loam soil when shaken with water are reported, together with a theoretical discussion of the nature of the reaction involved.

The results showed that the clay of the uncropped soils settled most rapidly, that of the cropped soils and of those receiving sodium nitrate settling slowest. The ammonium sulphate soils settled somewhat quicker than those receiving ammonium nitrate.

Cropping with potatoes retarded the rate of settling considerably, and to a greater extent than cropping with wheat and oats. The rate of settling in the cropped ammonium sulphate soil was less marked than that of the uncropped soil.

Cause of harmful effects of fertilizing with mineral compounds on humus sandy soils, J. HUDIG (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], 1912, No. 12, pp. 83–138, figs. 3*).—Previous investigations having shown that the so-called "oat sickness" of the soils of Drenthe and Groningen (E. S. R., 21, p. 115) was due to the continued use of alkaline or physiologically alkaline fertilizers, the author made further studies of the physiological effect of different organic extracts, sugar humus, and pyrogallol on oats grown on moor soil and on pure sand receiving a basal fertilizer to determine the nature of the "sickness." Attempts were made with unsuccessful results to isolate toxic compounds from the organic matter of the soils.

The results of these studies show that the harmful effect of the continued alkaline fertilization was due to the formation of unidentified humus compounds. These compounds exist principally in the alkali insoluble part of the organic matter.

When sugar humus was mixed with sand with addition of lime or soda and sodium nitrate, the sickness developed within a few years. Pyrogallol, with addition of alkali on sand, also produced the disease in a few years.

Tests with commercial fertilizers, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 106–113*).—Experiments with various fertilizer combinations, lime, and manure on onions, potatoes, grains, and grasses are reported.

In case of the onions "no visible results of the influence of the fertilizers could be observed." In case of potatoes "all of the fertilizers, with the exception of potash in some cases, increased the yield, even doubling and trebling it. . . . The applications of barnyard manure alone increased the yield in most cases, and in combinations with lime gave slightly greater returns. Lime alone produced slightly better returns than the check plat. Very marked results were obtained, however, in the use of combinations of carriers of potash, nitrogen, and phosphoric acid with and without lime." The results with grains and grasses were inconclusive.

Report on vegetation experiments carried out in 1912, H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 71, pp. 19, figs. 2*).—This includes accounts of experiments with "nitrate phosphate," a by-

product of the manufacture of synthetic nitric acid; with calcium nitrate and lime nitrogen; with radio-active fertilizers, particularly calcium-aluminum silicate; with sodium nitrate and ammonium sulphate; and with granite meal.

The nitrate phosphate, which contained 30 per cent of calcium, 30.5 per cent of phosphoric acid, 28.8 per cent of which was citrate-soluble, and 3.6 per cent of nitrogen, was fully as effective as a source of phosphoric acid as superphosphate. When thoroughly mixed with the soil the calcium nitrate was about as effective as sodium nitrate and ammonium sulphate. The granulated lime nitrogen used was somewhat less effective. The results with the so-called radio-active catalytic fertilizers were inconclusive. The granite meal gave good results as a source of potash. This is attributed to the fact that the potash was largely in the form of mica, which Prianishnikov has shown to be more available than other silicates.

Philippine guano, A. J. Cox (*Philippine Jour. Sci., Sect. A, 7 (1912), No 3, pp. 195–199*).—Analyses of a large number of samples from different parts of the islands are reported, showing a variation in nitrogen content from almost none to 8.81 per cent, and in phosphoric acid from very small amounts to 23.12 per cent. It is stated that the Philippine guanos "consist of the excreta of sea fowls and other birds, bats, and marine animals, with more or less bone and animal matter furnished by dead bodies, and are found in large quantities in some places, mainly on small islands and in numerous limestone caves. That from caves is usually bat excrement. Deposits of bat guano have been discovered on a great many of the islands, chief among which are Marinduque, Guimaras, Luzon, and Mindoro; and some of these have been located and recorded. The deposits in some of the caves are reported to consist of one or more thousands of tons. Probably as yet not over 1,000 tons of guano have been mined in the whole Archipelago. In a few instances considerable quantities of bat guano have been removed from church towers."

The peat bogs in Michigan: From an agricultural point of view, A. J. Patten (*Jour. Amer. Peat Soc., 5 (1912), No. 2, pp. 65–69; Sci. Amer. Sup., 74 (1912), No. 1928, p. 383*).—This article very briefly discusses peat as a direct fertilizer, as a filler for commercial fertilizers, as a stable litter, and as an agricultural soil. Its use for the first two purposes is condemned. As a litter it is very valuable. Reclaimed peat lands are often very valuable.

New observations on the behavior of nitrate in cultivated soil, II, J. Vogel (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 265–301; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1089; Chem. Zentbl., 1912, II, No. 26, pp. 2134, 2135; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3, (1912), No. 11, pp. 2379, 2380; Jour. Soc. Chem. Indus., 32 (1913), No. 2, p. 100*).—Summarizing the results of studies of changes in the soil nitrates reported in this and a previous paper (E. S. R., 27, p. 626), the author maintains that the present conception to the effect that sodium nitrate remains unchanged in soil when uncultivated and protected from washing, is not correct. On the contrary, there are conditions under which a rapid and extensive decomposition of the nitric acid salts of the soil takes place, forming oxids of nitrogen of different kinds, and sometimes probably also nitrogen and ammonia. The processes are, therefore, accompanied by losses of nitrogen.

Such decomposition of nitrates takes place when there is a distribution of the salt in very shallow layers of soil and when a definite water content is maintained for some time. This water content lies between 15 and 20 per cent with average soils, but may be higher or lower according to special conditions. When the water content becomes so high that puddling of the soil results, there is no longer any decomposition of the nitrates.

The decomposition process is purely chemical and presents a typical surface reaction in which colloid-chemical processes probably play a rôle. Micro-organisms are not concerned in the reaction.

The reaction is rapid and may reach its highest point in 3 or 4 days. After the reaction the soil is dry and powdery and settles slowly when washed with water. The reaction took place in all mineral soils used in the experiment irrespective of color and texture. The humus content alone, therefore, can hardly be the causative agent of the reaction.

Nitrate deposits, H. S. GALE (*U. S. Geol. Survey Bul. 523, pp. 36, pls. 2, figs. 2; abs. in Amer. Fert., 37 (1912), No. 11, pp. 37–44, figs. 2*).—The bulletin describes and discusses the origin of the principal nitrate deposits of the world, including also accounts of the known deposits in the United States, none of which is at present of commercial importance.

The nitrate deposits, W. S. MYERS (*Commercial Fert., 5 (1912), No. 4, p. 26*).—It is stated that "there are probably, in round numbers, 1,000,000,000 tons of nitrate in the deposits of Chile, and, without doubt, large supplies also exist on lands now but incompletely prospected. The surveyed and certified tonnage opened up at the present time ready for extracting is fully 250,000,000 tons."

The ammonia production (*Amer. Fert., 38 (1913), No. 1, p. 32*).—It is stated that the ammonia production in the United States in 1912 calculated as ammonium sulphate was 155,000 short tons as compared with 127,000 tons in 1911. At the beginning of 1912 there were 4,624 by-product coke ovens in operation in the United States and 698 in process of construction. It is estimated that from 55,000 to 60,000 tons of ammonium sulphate was imported into the United States in 1912 and that the total consumption of this material in that year was from 210,000 to 215,000 tons as against 221,633 tons in 1911.

Fixation of atmospheric nitrogen in nature and in industry, A. KROCZER (*Österr. Chem. Ztg., 15 (1912), Nos. 17, pp. 226–231; 18, pp. 245–247; abs. in Chem. Ztg., 36 (1912), No. 155, Repert., p. 691*).—This is a review of progress in the knowledge of natural chemical fixation of nitrogen, symbiotic and non-symbiotic fixation by micro-organisms, and technical fixation by electrical processes.

Potash from seaweed (*Chem. Trade Jour., 51 (1912), No. 1335, p. 646*).—Two attempts which are now being made in California to extract potash from seaweed on a commercial scale are briefly described.

Potash in Nebraska (*Amer. Fert., 37 (1912), No. 11, p. 54*).—A brief account is given of investigations by the U. S. Geological Survey showing that certain of the small shallow alkali lakes occurring in the sand hills of Nebraska contain considerable percentages of potash salts.

Potash in the Permian rocks of Texas, J. A. UDDEN (*Amer. Fert., 37 (1912), No. 12, pp. 40, 41*).—Analyses of water from a deep well (3,000 ft.) at Spur, Texas, showed the presence of considerable amounts of anhydrite and salt, and indicate "that the general physical conditions prevailing during the formation of the sediments here were like those prevailing in the Stassfurt region when the salt beds were formed there."

Phonolite as a fertilizer from the standpoint of its mineralogical-petrographic nature and chemical properties, E. BLANCK (*Fühling's Landw. Ztg., 61 (1912), No. 21, pp. 721–731*).—The potash in the phonolite is stated to be largely in the form of leucite, with smaller amounts of nepheline and other silicates. The fertilizing action of the phonolite is due mainly to the nepheline and leucite and must necessarily be small as compared with potash salts.

Submarine formation of phosphates (*Rev. Sci. [Paris], 50 (1912), II, No. 14, p. 433*).—A discussion by Joleaud of the origin and formation of the phosphate deposits of Tunis is briefly reviewed.

The effects of calcium and magnesium carbonates on some biological transformations of nitrogen in soils, W. P. KELLEY (*Univ. Cal. Pubs. Agr. Sci., 1 (1912), No. 3, pp. 39–49*).—The author reviews investigations on the subject by others and reports a preliminary study of the effect of varying amounts of calcium and magnesium carbonates, alone and combined, on ammonification and nitrification of dried blood in two different sandy soils from California.

The results show that "calcium carbonate stimulated the ammonification of dried blood to a limited extent but exercised a more noteworthy stimulating effect on nitrification. With magnesium carbonate a pronounced toxic effect was produced. In the ammonification of dried blood there was sustained a loss of about one-third as compared with the experiments without the use of carbonates, while in the nitrification experiments magnesium carbonate completely inhibited nitrate formation. It is also noteworthy that no evidence of antagonism between calcium and magnesium carbonates was observed."

Manganese as a fertilizer, M. X. SULLIVAN and W. O. ROBINSON (*U. S. Dept. Agr., Bur. Soils Circ. 75, pp. 3*).—The distribution of manganese in soils and its effect upon the growth of plants are briefly discussed.

Of the 26 American soils recently analyzed "all contain manganese (MnO) in proportions ranging from 0.01 to 0.51 per cent. The average content in these soils is 0.20 per cent, or about 8,000 lbs. in the acre-foot."

Experiments abroad with manganese salts as fertilizer are referred to.

Manures, R. H. CARTER and S. J. M. AULD (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 248–261*).—Analyses of miscellaneous fertilizing materials, including wool dust, shoddy and shoddy waste, cloth waste, fur waste, hair waste, fish guano, quail guano, Peruvian guano, bone meal, rape dust, manila wastings, rag refuse, cotton-seed waste, and esparto grass dust, are reported and discussed. It is stated that many of these materials are used in large quantities by hop and fruit growers in Kent.

Analyses of commercial fertilizers, 1912 (*New York State Sta. Bul. 354, pp. 363–482*).—The report gives the guarantied composition and actual analyses of samples collected during the year by the commissioner of agriculture of New York.

Analyses of commercial fertilizers, B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul., 1912, Oct., pp. 8*).—Guarantied and actual analyses and valuations of a part of the fertilizers inspected during 1912 are reported.

Analyses of commercial fertilizers, R. N. BRACKETT ET AL. (*South Carolina Sta. Bul. 171, pp. 68*).—The bulletin reports analyses and valuations of 1,689 samples of fertilizers examined during the season of 1911–12. Explanations of fertilizer terms and provisions of the state fertilizer law, the taking of samples by farmers, and valuation of fertilizers are given.

Fertilizer inspection, 1912, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 242, pp. 37*).—Analyses of 323 samples of fertilizers collected in Canada during April and May, 1912, are reported. "Of this number 287 samples meet the guarantied value of the brands which they represent, and for which they are sold." One hundred and eight of the brands examined were imported.

AGRICULTURAL BOTANY.

The progress of agricultural bacteriology, I, II, F. LÖHNIS (*Ztschr. Gärungsphysiol., 1 (1912), Nos. 1, pp. 68–74; 4, pp. 340–370*).—Of some 1,200 investigations in agricultural bacteriology published since the appearance of

the author's Handbook of Agricultural Bacteriology in 1910 (E. S. R., 23, p. 720), he has selected those considered most valuable in this connection as the basis of discussion in these two articles. The topics are treated in much the same order as in the handbook, giving in very condensed form a digest of the results and views presented by various authors, including a discussion of the presence and activity of bacteria in food stuffs, milk products, manures, and soils. An extensive bibliography is appended.

On the fungi of the soil, ELIZABETH DALE (*Ann. Mycol., 10 (1912), No. 5, pp. 452–477, pls. 6*).—A study is reported of the fungus flora of two soils taken from adjacent plats on the Royal Agricultural Society's farm at Woburn. The soil is light and sandy. Twenty genera of fungi were obtained from the samples of soil, and the species are described at some length. Attention is called to the striking resemblance to the fungus flora of North American soils as described by Jensen (E. S. R., 27, p. 728), many of the genera and species being the same as those determined by the author.

The influence of medium on some of the lower fungi, L. RAYBAUD (*Rev. Gén. Bot., 24 (1912), No. 286, pp. 392–402*).—The results are given of the author's investigations on the effect of light, pressure, vapor tension, osmotic strength of solutions, transpiration, and nutrient media on the growth and sporulation of *Phycomyces nitens* and *Rhizopus nigricans*.

Studies on Azotobacter.—I, Morphology and cytology, A. PRAŹMOWSKI (*Bul. Internat. Acad. Sci. Cracovie, Cl. Sci. Math. et Nat., Ser. B, 1912, No. 3, pp. 87–174, pls. 3*).—The author gives an account of the present state of knowledge concerning the life and activities of *A. chroococcum;* of some investigations and the methods followed; and of the general and special morphology and the general and special cytology of this organism. A bibliography is appended.

Cytological and experimental studies in Citrus, I. OSAWA (*Jour. Col. Agr. Imp. Univ. Tokyo, 4 (1912), No. 2, pp. 83–116, pls. 5, fig. 1*).—The author has investigated the development of pollen grains and embryo sacs in Citrus in general, and studied the irregularities and anomalies occurring in the varieties Unshu and Washington Navel. Among the conclusions given are the following:

In *C. trifoliata*, fertilization appears to take place about 4 weeks after pollination. The primary endosperm nucleus may divide immediately after fertilization, and earlier than the oospore nucleus. The first nuclear division of the oospore appears to take place 3 or 4 weeks after fertilization.

In a study of the fruits the author found that the so-called "navel" at the top of the Washington Navel orange is due to the multiplication of loculi and carpels, and to the protrusion of these new carpels beyond the top of the fruit. In studying the pollen grains he found that in the variety Unshu they are mostly irregularly shaped and sterile. Disintegration of the pollen cells in the Washington Navel orange occurs as early as the sporogenous stage, and no pollen grains are found in the anthers at the time of flowering.

Disintegration of the embryo sacs sometimes takes place in the varieties studied. As normal embryo sacs are produced in Unshu and Washington Navel they may produce a few seeds if pollinated with good pollen grains from fertile species of Citrus. The small number of seeds in many cases is evidently due to the frequent disintegration of the embryo sacs. Seedless fruits in Citrus are produced, chiefly owing to the lack of fertility of pollen grains and partially to the frequent disintegration of the embryo sacs.

Cytological investigations on the formation of starch and plastids in plants, A. GUILLIERMOND (*Arch. Anat. Micros., 14 (1912), No. 3, pp. 309–428, pls. 6, figs. 11*).—A report is given on the method of formation of starch and the origin of plastids in plants.

The author concludes that starch is not formed in the chloroplasts but is always a product of the leucoplasts, which, on account of their minuteness, are difficult of demonstration. The leucoplasts, chloroplasts, and chromoplasts of phanerogams have a mitochondrial origin. From a chemical-histological examination, these plastids present the same coloration as mitochondria and are not distinguished except by their resistance to acetic acid and alcohol. The author considers that from their behavior the mitochondria and the plastids are apparently formed of very similar materials, and he believes that the plastids like the mitochondria differentiate for a special function. The mitochondria, he claims, are incapable of forming themselves except by the division of preexisting ones, which are transmitted from the mother plant to the egg and from the egg to the embryo and the adult plant. He thinks that the mitochondria in plants not only serve as the generators of the plastids, but that they perform an important rôle in the elaboration of the products of secretion and in the differentiation of the cell.

A bibliography is appended.

Structure of the starch grain, M. W. Beijerinck (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 14 (1912), pt. 2, pp. 1107–1110, fig. 1*).—The author states that if a quantity of starch is boiled with sufficient water to bring the grains to their maximum of swelling, and a strong tannin solution be made to flow sideways under a cover glass, the grains, which before seemed homogeneous as to structure, now show a very distinct membrane through which the tannin easily diffuses to the inside where it forms a characteristic precipitate. With a dilute solution, this precipitate is seen to consist of little droplets in very lively Brownian movement; with a more concentrated solution it consists of solid particles adhering together and filling the whole inner space of the vesicle.

The author thinks that there can be no doubt that the boiled starch grain consists of a solid but very soft sac-shaped closed wall containing a liquid. The latter is supposed to be a granulose or amylose solution, containing 0.6 of the substance of the starch originally used, the wall containing the remaining 0.4. These sacs can be burst and the contents freed by rubbing the boiled starch with fine sand; or the contents may be dissolved out through the envelopes by constantly renewing the water for some days. The vesicles, freed from their contents, when treated with iodin take a somewhat violet color, rather lighter than does the granulose solution. When preserved they become partly soluble in water containing chloroform. By leucodiastase they are easily converted into maltose and dextrose quite like granulose.

A study on the maturation of fruits, A. Contino (*Staz. Sper. Agr. Ital., 45 (1912), No. 5–6, pp. 460–472*).—The author gives the results of analyses made of ripening Japanese persimmons along with which the bearings of the figures obtained upon hypothetical reactions are considered. The tannin compounds are said to disappear almost entirely. The sugars are said to be represented in the ripe fruits by levulose and dextrose, the latter predominating and saccharose being absent. The extension of these researches to other fruits is promised.

The variation of fat, sugar, and saponin during the maturity of seeds of Lychnis githago, Marie Korsakoff (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 23, pp. 1162–1164*).—Studies were made of the seeds of corn cockle at different stages of development to determine the variation of some of their constituents.

The proportion of substances soluble in ether diminished from the youngest stages of the seed toward maturity, as did the sugar content, while the saponin content, on the contrary, increased with the development of the seed, the very

young seeds hardly showing a trace of this glucosid while the mature ones contained it in considerable quantity. As saponin exists only in very small quantity in other portions of the plant it is thought that it probably is formed in the seed. The progressive disappearance of sugars and accumulation of saponin indicates that there is a relation between these two phenomena and that the presence of the glucosid depends upon the sugar formed in other portions of the plant.

Assimilation of nitrates and nitrites, IV, O. BAUDISCH (*Ber. Deut. Chem. Gesell., 45 (1912), No. 13, pp. 2879–2883*).—This is in pursuance of former conclusions (E. S. R., 27, p. 226) and in reply to a physiological criticism by O. Loew (E. S. R., 27, p. 332).

The influence of the acidity of green plants on the utilization of insoluble phosphates, G. CORSO (*Ann. R. Staz. Chim. Agr. Sper. Roma, 2. ser., 5 (1911), pp. 123–132*).—Already noted from another source (E. S. R., 26, p. 321).

Influence of phosphate on the toxic action of cumarin, J. J. SKINNER (*Bot. Gaz., 54 (1912), No. 3, pp. 245–249*).—In a previous paper (E. S. R., 27, p. 520) attention was called to the fact that phosphate in nutrient solutions was able to overcome the toxic effect of cumarin on wheat seedlings. In these experiments monocalcium phosphate was used, and the possibility of the calcium being the neutralizing agent has been considered. Experiments are therefore reported in which monosodium, disodium, and trisodium phosphates were employed, from which the conclusion is drawn that the peculiar action of phosphate salts in overcoming the toxic effect of cumarin is due to the phosphate radical and not to the presence of any particular base, or to the acid or alkaline reaction of the nutrient solution.

The presence of arsenic in the plant kingdom, F. JADIN and A. ASTRUC (*Jour. Pharm. et Chim., 7. ser., 6 (1912), No. 12, pp. 529–535*).—Analyses are reported showing the arsenic content of 85 species of plants, representing about 30 families of flowering plants and mushrooms.

From the results obtained the author considers arsenic to be quite generally distributed throughout the vegetable kingdom. In a study of such plants as mistletoe, where there is no connection between the plant and the soil, arsenic was found present, and there appeared to be no relation between the arsenic content of the parasite and that of its host plant. In general, the proportion of arsenic to dry matter was considered the best means of comparing the mineral content of the different species. Except in isolated cases, the arsenic found in a certain species gave no indication of that to be expected in other members of the same plant family. The chlorophyll-bearing parts of plants always gave a higher arsenic content than any other portion.

The author believes that the arsenic normally present in animal organs comes from plants which the animals have eaten.

The behavior of plants toward lithium salts, C. RAVENNA and A. MAUGINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 5, pp. 292–298*).—In continuation of studies previously noted (E. S. R., 23, p. 726), the authors investigated the effects of lithium sulphate on the development of plants in pure white sand supplied with a complete nutritive solution, such solution with an addition of 0.2 per cent lithium sulphate, and the same solution with the potassium salt replaced entirely by lithium sulphate. In July or August the plants, then three or four months old, were analyzed and lithium was found to have acted injuriously on practically all tested. Soy beans, tomato, white mustard, hemp, sunflower, flax, vetch, and Indian corn taken in order, exhibited the injury in decreasing degree. In most cases the difference between the effects of the second and those of the third solution was marked.

Experiments on Kentucky tobacco supplied with varying amounts and proportions of potassium and lithium salt appear to show that tobacco is able to utilize certain small proportions of lithium salts.

The effects produced by metallic salts on yeasts and other fungi, T. Bokorny (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 6–10, pp. 118–197*).—The author gives a report of numerous experiments made by him to determine the nutritive or deleterious effects exerted by about 50 metallic salts on yeast and other fungi along with other lower forms. The detailed results are tabulated.

It was found that the ordinary nutritive salts, monocalcium phosphate and magnesium sulphate, may without injury be supplied to yeast in very much higher concentrations than its composition requires. It is not apparent that every salt acts as poison at all concentrations above a certain point. Enzyms as well as plasma may be poisoned by certain metals. Apparently there exists a close dependence between enzyms and protoplasm. Only 3 metals, copper, mercury, and silver, were found to be injurious until a very high dilution of their salts was reached.

The physiological action of some neutral salts of alkalis and alkaline earths on green plants, T. Bokorny (*Biochem. Ztschr., 43 (1912), No. 5–6, pp. 453–477; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 600, II, p. 975*).—Continuing the above work, the action of several neutral salts of alkalis and alkaline earths on various higher and lower plants was investigated.

It was found that calcium nitrate has a more favorable effect on Spirogyra than any other salt, and that it also favors the growth of seedlings of various common cultivated plants. Rubidium sulphate at 2 per cent is also highly favorable in case of these latter plants, but is harmful at 5 per cent. Cæsium sulphate at 0.01 per cent is favorable to barley, while higher concentrations are less so or are injurious. Lithium sulphate in solutions of from 0.005 to 0.01 per cent acts favorably on growth. Other salts tested were less favorable than the first two named.

The influence of potassium, rubidium, and cæsium on the development and the sporulation of Aspergillus niger, B. Sauton (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 23, pp. 1181–1183*).—The author reports that the substitution of rubidium for potassium diminished the growth of the fungus by at least 50 per cent. Cæsium proved not adapted as a nutrient for *A. niger*, while potassium exercised a decided influence on the formation of spores. When rubidium or cæsium was substituted for potassium no spores were formed.

Absorption of barium chlorid by Aragallus lamberti, C. D. Marsh (*Bot. Gaz., 54 (1912), No. 3, pp. 250–252*).—A brief account is given of investigations to determine the absorption of barium chlorid by *A. lamberti*.

A preliminary experiment showed that growing plants were injured when watered with a 10 per cent solution, but subsequent experiments with 0.1 and 1 per cent solutions showed that the plants endured barium chlorid solution as strong as 1 per cent without bad effect. The plants in the different experiments were analyzed, and the largest barium content was found in those treated with the strongest solutions. In other words, it appeared that the quantity of barium salt absorbed varied directly with the amount in the soil.

The effect of some aromatic substances on the formation of cyanogen in plants, C. Ravenna and G. Bosinelli (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 5, pp. 286–292*).—The authors investigated the effect on the production of cyanogen by *Sorghum vulgare* of the introduction into the stalk of benzoic, salicylic, or phthalic acids or of pyrocatechin, resorcin, hydrochinon, or pyrogallol.

The tabulated results of these experiments show that all the plants so treated produced less hydrocyanic acid than did the controls. The lowering was con-

siderable in case of benzoic and phthalic acids and hydrochinon, which were administered in the larger proportions.

Effect of solanin on the potato plant, J. J. SKINNER (*Plant World, 15 (1912), No. 11, pp. 253–256, fig. 1*).—Experiments in growing potatoes in culture solutions containing solanin showed that although solanin is a constituent of potatoes it is harmful to the growth of the potato plant when present in culture solutions.

The association of tannin with an emulsion colloid in the acorn, F. E. LLOYD (*Johns Hopkins Univ. Circ., n. ser., 1912, No. 2, pp. 15–18*).—A summary is given of a lecture delivered before the department of botany of the Johns Hopkins University, in which it is shown that the tannin in the idioblasts of the acorn occurs in association with a second colloid. This is held to be an emulsin colloid, and not a protein but a mucilage-like substance. This theory is in conformity with that previously described (E. S. R., 27, p. 228).

The resistance offered by leaves to transpirational water loss, B. E. LIVINGSTON (*Johns Hopkins Univ. Circ., n. ser., 1912, No. 2, pp. 11–13*).—A description is given of an application of Stahl's test with cobalt chlorid for determining the water loss by transpiration.

It was shown by this method that the water-withholding power of ordinary leaves is much greater at certain hours of the day than at others. The cobalt test also brings out the marked increase in the power to withhold water as leaves advance in age. It is easy to compare the resistance offered to water loss by the foliage of different plant forms, and the author claims that the study of the relative drought-resisting powers of different varieties of plants would be facilitated by this method.

The respiration changes in separated foliage leaves, N. T. DELEANO (*Jahrb. Wiss. Bot. [Pringsheim], 51 (1912), No. 5, pp. 541–592, figs. 2*).—Experiments carried out by the author on detached grape leaves are thought to show that during about the first 100 hours only carbohydrate (starch) is converted, forming carbon dioxid, nitrogenous bodies remaining unchanged. After this period, the starch having disappeared, the character of the respiration process apparently undergoes a change, coagulable proteins being changed into soluble products, among others into ammonium salts; but no nitrogen escapes from the leaf. The ash content, which increases somewhat during the first period, decreases during the second.

It is inferred that leaves on the plant normally employ only carbohydrates in respiration, but that in case of exhaustion of this supply they are able to carry on that process by use of nitrogenous bodies. See also a previous note (E. S. R., 26, p. 822.)

The action of the respiratory enzyms of Sauromatum venosum, T. WEEVERS (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 14 (1911), pt. 1, pp. 370–377*).—The author summarizes his experiments as follows:

"By pressing out and precipitating the press juice with alcohol or acetone there can be obtained from the spadix of *S. venosum* a crude enzym that decomposes glucose with the formation of carbonic and organic acids, but without any production of alcohol either in the air or in a hydrogen atmosphere. Destruction of the cellular structure and treatment with alcohol or acetone do not therefore inactivate the respiratory enzyms in the present case, their power of decomposing sugar remaining very marked.

"In the same way a crude enzym is obtained from the leaves of Sauromatum, which is similar but has a weaker action.

"In the ether extract of the acid liquid citric acid was demonstrated, which acid very probably must be formed by the respiratory enzyms at the expense of the glucose."

The photochemical synthesis of carbohydrates under the influence of ultraviolet rays, J. Stoklasa, J. Šebor, and W. Zdobnický (*Biochem. Ztschr., 41 (1912), No. 5, pp. 333–372, fig. 1*).—Continuing previous work (E. S. R., 26, p. 430), the results of which are said to be supported by those of A. J. Kluyver (E. S. R., 27, p. 827), the authors report further investigations, from which they conclude that under the influence of ultraviolet rays on formaldehyde in the presence of carbohydrates with access of air or oxygen, the direct formation of carbon dioxid or water does not occur, but that the formaldehyde appears as a source of formic acid, which under the conditions of its formation develops carbon dioxid and water. Hexoses form under such conditions upon the addition of ferrous compounds, with or without potassium bicarbonate. It is suggested that in the changes resulting in the formation of carbon dioxid or water there is a reversal of the process of photochemical assimilation of carbon dioxid which takes place in the chlorophyll containing cell. Details are given of these and related hypothetical changes.

The influence of radioactivity on the development of plant organisms, J. Stoklasa (*Österr. Chem. Ztg., 15 (1912), No. 22, pp. 301–303*).—The above work has been extended to the influence of radium emanations, which show some suggestive analogies. It was found that, while in certain strengths and durations either no effect or injurious effects were produced on sprouting seeds or growing plants, under different conditions growth was favored with synthesis of sugar, the character of which is still under investigation.

Investigation of the transmission of light stimuli in the seedlings of Avena, P. C. van der Wolk (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 14 (1911), pt. 1, pp. 327–342*).—A preliminary report of his investigations.

"To sum up, we have been able to analyze the process of phototropic stimulation into the primary electro-physiological perception process which causes the remarkable polar division of sensitiveness between the apex and the base and by this means has become the actual cause of the irreversibility of the phototropic curvature effect and in addition, secondarily, the photochemical process which brings about the curvature. Possibly we may be able to refer the decrease of the phototropic curvature effect by means of greater quantities of energy, as also rectipetality, to the origin of polarization currents, to which the polar accumulations of ions in their turn give rise."

The influence of light on the transpiration of green leaves and those without chlorophyll, Læclerc du Sablon (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 18, pp. 847–849*).—As a result of previous investigations (E. S. R., 26, p. 430), the author has come to the conclusion that increase in transpiration of succulent plants is not due to the action of sunlight on the chlorophyll but rather to an increased permeability of the protoplasmic membrane.

The effect of direct sunlight, diffused light, and darkness on variegated and etiolated leaves has been studied, and the transpiration of green, variegated, and etiolated leaves found to be about equally affected by the different degrees of illumination. Leaves that were variegated, as well as those that were completely colorless, transpired more in direct sunlight and in diffused light than in darkness, and this is held to indicate that transpiration is due to permeability of the protoplasmic membrane and not to the presence of chlorophyll.

A historical sketch of the application of electricity to the stimulation of plant growth, P. Ehrenberg (*Fühling's Landw. Ztg., 61 (1912), No. 21, pp. 733–739, figs. 2*).—A historical note on the application of electricity as a means for stimulating plant growth is given, in which an account is presented of experiments made by Bertholon in 1783. Some earlier work is briefly mentioned.

Are constant currents of electricity in soil injurious to plants, and why? E. SCHNECKENBERG (*Elektrochem. Ztschr., 19 (1912), No. 6, pp. 151–154*).—The author states that the results of numerous experiments with electrical currents on grasses, grains, legumes, forest trees, mosses, algæ, and fungi, continued since 1907, lead to the general conclusion that a constant current is in very different degrees injurious to both the germination and the development of plants. This influence, more or less strong elsewhere, is most marked in the region immediately between the electrodes. Tension, current strength, and duration are factors in the degree of injury, as also are conductivity of soil; form, size, and interval of the electrodes; position of plant or part with respect to the electrodes; warmth, moisture, and light; and chemical composition of the soil. Electrolysis is held to play an important part, the soil or its surface layer acting in a degree as a semipermeable membrane in relation to the water and other constituents of the soil and plant.

Studies in Nicotiana, I, W. A. SETCHELL (*Univ. Cal. Pubs. Bot., 5 (1912), No. 1, pp. 86, pls. 28*).—This is the first of a series of publications designed by the author to give the results of the work of himself and others in connection with experiments with Nicotiana at the botanical garden of the University of California. The present paper is largely a study of the systematic and morphological relations of the plants that have been brought together, about 17 species with numerous varieties being described.

Quantitative studies of inheritance in Nicotiana hybrids, T. H. GOODSPEED (*Univ. Cal. Pubs. Bot., 5 (1912), No. 2, pp. 87–168, pls. 6*).—In this publication the author gives an account of studies on the relation between the weights of hybrid tobacco seed and the inheritance of certain characters in the F_2 generation, and on the quantitative expression of imperfect dominance in the corolla diameters of the flowers on the hybrids produced from 3 varieties of *N. acuminata*.

The cultural bud mutation of Solanum immite, E. HECKEL (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 18, pp. 804–806*).—In continuation of studies on the mutation of species of Solanum (E. S. R., 27, p. 230), the author gives an account of his experiments with *S. immite*, which by the excessive application of fertilizers produced in a single year mutations that resembled some of the cultural forms of *S. tuberosum*. This is thought to be of striking importance on account of the suddenness of the appearance of the mutants.

Experiments with *S. jamesii* which have been carried on for 3 years have shown only a slight change in color of the tubers.

The origin of the cultivated varieties of the potato, E. HECKEL (*Rev. Sci. [Paris], 50 (1912), II, No. 21, pp. 641–646*).—The author summarizes recent experiments and investigations on bud mutations in potatoes as shown by the cultivation of wild tubers of *Solanum commersonii*, *S. maglia*, and *S. tuberosum*.

The results of experiments in bud mutation of Solanum maglia and S. tuberosum, C. VERNE (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 10, pp. 505–509; Bul. Soc. Nat. Agr. France, 72 (1912), No. 8, pp. 698–716, pl. 1, figs. 3*).—An account is given of cultural experiments with tubers of *S. maglia* and *S. tuberosum* collected in a wild state in parts of South America. The method followed was that of abundant application of fertilizers described by Heckel (see above). A single season's work has resulted in the production of larger tubers than the wild specimens, but the general characters of long stolons, color, and habit have not been greatly changed, though there are apparently some indications of the disturbance of the equilibrium of the species.

Proceedings of the Scientific Society of Brünn (*Verhandl. Naturf. Ver. Brünn, 49 (1910), pp. XXI+363, pls. 15, figs. 10*).—In addition to the usual routine report of the society, the present volume gives an account of the un-

veiling of a monument to Gregor Mendel and also presents a number of papers relating to various phases of plant and animal breeding. Three original papers of Mendel's are reprinted, their titles being: Experiments on Plant Hybridization, Artificial Fertilization of Hieracium hybrids, and The Tornado of October 13, 1870. Other titles are as follows: Mendel's Law and the Transmission of Acquired Characters, by P. Kammerer; The Adaptation of *Antholyza bicolor* for Fertilization by Birds, by O. Porsch; The Transmission of Morphological Characteristics in *Hordeum distichum nutans*, by C. Fruwirth; A Case of Factor Coupling in *Antirrhinum majus*, by E. Baur; The Spontaneous Omission of Color Factors in Oats, by H. Nilsson-Ehle; Defective Inheritance Ratios in Bursa Hybrids, by G. H. Shull; The Inheritance of Time of Flowering in Peas, by E. von Tschermak; Mendelian Characters in Plants, Animals, and Man, by C. C. Hurst; Heredity in Mice, by L. Cuénot; The Interrelation of Genetic and Nongenetic Factors in Development, by A. L. Hagedoorn; Somatic Inheritance in the Light of Hybrid and Variety Breeding, by R. Semon; Albinism in Inbreeding, by H. Przibram; The Inheritance of Blastogenic and Somatogenic Characters, by W. Roux; Gametic Series Involving Reduplication of Certain Terms, by W. Bateson and R. C. Punnett; and The Mendel Monument and Its Unveiling, by H. Iltis.

FIELD CROPS.

[Culture and variety tests of field and forage crops], W. H. Lawrence (*Washington Sta. Bul. 7, spec. ser., pp. 14–59, 112, 113, figs. 25*).—This report presents the results of culture and variety tests secured from 1908 to 1910 on different types of soil of a long list of crops grown for grain production, forage purposes, and soil protection and improvement. In some instances, fertilizer treatment was also given.

Thousand-headed kale proved to be a desirable forage crop, although subject to injury through alternate freezing and thawing, and also susceptible to root rot. In 1909, a yield at the rate of about 1,800 lbs. of seed per acre was secured. Marrow cabbage was found adapted to a wider range of soils than the kale, being more thrifty on tenacious and sticky upland clays. On a small scale, a large yield of seed of good quality was produced. Dwarf Essex rape gave poor results owing to attacks of aphids. A Chinese rape, B. P. I. No. 24162, yielded seed at the rate of 2,772 lbs. per acre and was not subject to insect attacks. Plant lice and club root also interfered with the growth of turnips and ruta-bagas. The cost of growing the largest yielding varieties of ruta-bagas is reported as having varied from $2.35 to $3.35 per ton.

Some very heavy yields were recorded for mangels grown on muck soil. Mammoth Golden Giant, yielding 77.4 tons of material per acre, produced roots at a cost of $1.94 per ton. Transplanting proved a failure when it was done before the tap roots were well formed and strong and from 4 to 6 in. long. Plants transplanted from a hot bed were stronger and more productive than plants transplanted from cold frames, and in this connection young plants were also benefited by the removal of two-thirds of the leaf surface. Of 6 varieties of carrots, St. Vallery and White Belgian ranked first in yield with 23.81 and 21.40 tons of tops and roots per acre respectively. In a test of 32 varieties, Sutton Matchless White stood first with a yield of 48.85 tons of roots per acre, the cost of production being $3.61 per ton. Seed from selected plants gave the best results. In 1909, red Jerusalem artichokes yielded at the rate of 20.26 tons per acre and in 1910 the white variety on sandy soil produced at the rate of 38.9 tons per acre.

The results of an extensive variety test of corn showed that the varieties from North Dakota and Minnesota were in general the most promising. In-

different returns were secured from Jerusalem corn, Kafir corn, broom corn, Primitive Husk corn, Giant Cuzo corn, branching Doura, sugar cane, and yellow milo maize.

Twenty varieties of oats were tested in 1909 and 1910 on sandy soils. The first year the Red oat led with a yield of 86.3 bu. per acre and the second year a variety designated as No. 12143 ranked first with a yield of 119.2 bu. In 1910, much higher yields were obtained on sandy than on shot-clay soil. The varieties in general ripened earlier on the clay than on the sandy soil, variety No. 143 ripening 9 days and the Red oat 33 days earlier. Winter oats did not prove a success.

Of a number of varieties of wheat, mostly hybrids grown in 1910, the largest yield, 48.5 bu. per acre, was secured from a cross between Turkey Red and Blue Stem. The strongest stooling variety was a cross between Red Russian and Jones Winter Fife, which gave a yield of 45.5 bu. per acre.

Rye appeared to give better yields on sandy soil than on the clay lands. In 1910, the yields of 4 varieties on sandy soil ranged from 34.2 to 50.6 bu. per acre, while on the shot-clay soil the range was from 11.1 to 18.8 bu. Several varieties sown on upland clay during the early spring failed to mature properly.

In 1909, the yields of 6 varieties of barley ranged from 16.6 to 36.6 bu. per acre, the highest yielding sort being Beardless, which also ranked first in the production of straw with 3.28 tons per acre. In 1910, this same variety produced 60 bu. of grain per acre.

The additional forage crop work undertaken included a comparison of 13 different grasses of which meadow fescue ranked first in yield with 4.72 tons of hay per acre in 1909, and timothy with 6.96 tons of hay per acre in 1910. Tall meadow oat grass grew with especial rapidity and made an early spring growth. Brief notes are given on the behavior of awnless brome grass, English rye grass, and Italian rye grass. In 1910, 8 varieties of field peas produced yields ranging from 30.2 to 45.5 bu. per acre, the leading variety being White Seeded Golden Vine. In 1909, White Canadian produced at the rate of 72.6 bu. per acre. The results showed in general that better crops of peas were produced on the shot-clay than on the more porous soils. *Lathyrus articulatus* and *L. ochrus* appeared best adapted to a sandy soil and examinations of their roots showed an enormous supply of large nodules. The Tangier pea (*L. tingitanus*) gave great variations in yield but gave also good promise. On clay-loam soil it produced at the rate of only 14 bu. of grain per acre, while on a residual clay the yield was at the rate of 72.5 bu. A wide range in yield was also observed in *Vicia ervilea* and *V. sativa*. The highest yield of grain per acre, 37.7 bu., was secured from *V. ervilea* and the second best yield among the different species was 32 bu. per acre from *V. atropurpurea*. Brief notes are given on hairy vetch, native vetch, Egyptian lentil, cowpeas, and horse beans.

Report of the agronomist, T. S. Parsons (*Wyoming Sta. Rpt. 1912, pp. 39–45*).—Of 2 varieties of winter wheat tested Turkey Red appeared well adapted to the conditions, and of 8 varieties of spring wheat, John Brown, a recently introduced Australian wheat, and Defiance gave the best results, yielding 32.33 and 32 bu. per acre respectively. Winter emmer did not survive the winter, while winter rye gave good results. In a test of varieties of oats, home-grown seed gave much better yields than imported seed. All varieties of barley gave good results, 2 newly tested sorts, California Feed and Hanna, ranking first in yield.

General notes are given on work with alfalfa, field peas, potatoes, root crops, combinations of grass seeds for permanent pasture and meadows, and forage crop mixtures of grains, peas, and other legumes. Irrigation and fertilizer experiments are briefly noted. Dry farming results with flax, spring and winter

rye, potatoes, and forage crops are reported and the yields of 15 varieties of oats, 6 of wheat, 8 of barley and of rye, spelt, millet, oats and peas, field beets, and sugar beets grown at the Wheatland demonstration farm are tabulated.

Crop calendar and manual of agricultural information for the Yaqui Valley, Sonora, Mexico, as determined by experiments previous to July 1, 1911 (*Yaqui Valley [Mexico] Expt. Sta. Bul. 1, 1911, pp. 12, pl. 1*).—This bulletin gives the results of testing varieties of crops to determine those suitable to that locality under various cultural treatments. The tropical and semitropical crops, including wheat, corn, chick pea (garvanzo), beans, alfalfa, rice, cotton, truck crops, sorghum, citrus fruits, garden fruits, dates, and grapes, grew well, while northern varieties of berries and deciduous fruits were not adapted to the conditions.

The results are tabulated.

The application of electricity in agriculture, J. W. PRIESTLEY (*Trans and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc., 24 (1911–12), pp. 140–143*).—This paper is a revision of a brief report by the *Dumfries and Galloway Standard* of a lecture which gave a history of the subject with some results of experiments. Wheat, when electrolized, showed an increase of 29 per cent; mangels, 18 per cent; and strawberries, 25 per cent.

Manuring experiments, E. KINCH, D. TURNER ET AL. (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 9–21*).—The experiments reported have a special bearing on the use of sulphate of ammonia in the production of swedes, mangolds, and oats on 7 farms in Gloucestershire.

Grass land (1888–1911): Manurial experiments on permanent grass, E. KINCH and R. G. STAPLEDON (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 1–8, pls. 2*).—Results are reported of manurial experiments on permanent grass plats, some of which have had similar treatment for over 20 years.

The effect of the drought of 1911 on Cotswold grass land, R. G. STAPLEDON (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 34–43*).—This article is a partial report of an investigation in regard to the effect of drought (E. S. R., 27, p. 510) upon the botanical composition of the grasses from several Cotswold pastures and hay fields.

Bromus erectus showed high drought-resisting qualities in a 25 cwt. per acre yield of hay in a field that consisted of 45 per cent *B. erectus* as compared with a yield of 5 cwt. with only 6.6 per cent of the same grass. *Poa trivialis* is reported to have shown great recuperative powers. It advanced from the merest trace to 17 per cent of the total herbage on one field four months after the drought. *Festuca elatior* on thin soil withstood the drought well, giving 21 per cent of the meager hay crop of the field.

An example of intensive farming in the cotton belt, M. A. CROSBY (*U. S. Dept. Agr., Farmers' Bul. 519, pp. 13, figs. 7*).—This gives the results secured on a 2-acre farm in Alabama, and describes the conditions under which the farm was begun, the method of soil improvement and crop rotation, and the income of the farm as carried on under intensive cultivation. One of the principal aims of the system of farm management pursued was the incorporation of liberal amounts of organic matter in the soil as the chief factor in maintaining and increasing fertility.

Some new alfalfa varieties for pastures, G. W. OLIVER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 258, pp. 39, pls. 11*).—The author notes the discovery of many new varieties of alfalfa in North Africa, from which seeds have been secured, and further work by crossbreeding and vegetative propagation that has been carried on. Special stress is laid on the rhizome-forming alfalfas for pastures. Detailed descriptions of 16 crosses are given.

"Some of the plants have revealed underground rhizome-forming characters which seem to be correlated with drought and cold resistance. Modifications of these characters have been found in some of the cultivated strains, such as the Grimm, Baltic, Turkestan, and Mongolian alfalfa. In the more tender alfalfas, such as the Peruvian, these characters seem to be absent."

Many crosses were made between recently discovered rhizome-forming alfalfas and some of the standard varieties to provide pasturage forms suited to certain localities.

Viable Bermuda grass seed produced in the locality of Raleigh, N. C., O. I. TILLMAN (*Jour. Elisha Mitchell Sci. Soc., 28 (1912), No. 2, p. 95*).—This article relates to the discovery of seeds of Bermuda grass (*Cynodon dactylon*) near Raleigh, N. C., which, when tested, showed 82 per cent and 60 per cent germination against 27 per cent and 17 per cent from samples of commercial seed.

The analysis of characters in corn and their behavior in transmission, W. B. GERNERT (*Champaign, Ill., 1912, pp. 58, figs. 2*).—The work, of which this paper is a partial report, has been a search for characters in the corn plant throughout its entire period of growth to discover how many and what they are, and how they behave in transmission. Data have been collected from a large number of publications and an extended bibliography is attached.

Cultural experiments with green fodder corn, WACKER (*Fühling's Landw. Ztg., 61 (1912), No. 22, pp. 745–762*).—In a comparison of yields in a 3-year experiment United States corn (maize) produced 35.4 tons, Natal corn 34.2 tons, and European varieties only 27 tons per acre of green fodder. A result of a test of 16 varieties of corn from domestic and foreign sources is also reported.

Variety test of corn and cotton, 1912, J. M. KIMBROUGH (*Georgia Sta. Circ. 68, pp. 3*).—This circular gives the yields in bushels of shelled corn per acre, percentage of grain, and number of ears per bushel of 16 varieties; also the results with 25 varieties of cotton, giving pounds of seed cotton per acre, percentage of lint per acre, and number of bolls per pound of seed cotton.

The kaoliangs: A new group of grain sorghums, C. R. BALL (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 253, pp. 64, pls. 2, figs. 15*).—This bulletin discusses the distribution, culture, and uses of the kaoliangs in eastern Asia, gives the history of their introduction into the United States, and reports the results of testing the varieties introduced. Descriptions of the plant and seed characters of all the introductions and a description of the group as a whole are presented and 27 distinct varieties are named and described for the first time with complete keys for their separation.

It is pointed out that the kaoliangs are good grain producers but of little value for forage on account of their scanty foliage. The earliest variety Manchu Brown was found to mature in from 85 to 95 days in the southern Plains area, and in from 100 to 110 days in South Dakota. Of 9 strains thoroughly tested at Amarillo, Tex., from 1908 to 1911, inclusive, 4 produced average yields of more than 20 bu. per acre and the other 5 produced from 13.8 to 18.8 bu. per acre. The average yield for the 9 strains was 19.7 bu. for the 4-year period, while the average yields of corn varieties under the same conditions were less than 5 bu. At Highmore, S. Dak., strains of Manchu Brown produced an average yield of 13.7 bu. for the 3 years 1909 to 1911.

C[illegible] Variety experiment with oats, D. TURNER (*Ann. Sci. Bul. Roy. Agr. Col. ai[illegible]irencester, 1911, No. 3, p. 44*).—The results of a test with 17 varieties of oats [illegible]re given in tabular form.

pp[illegible] [Potato experiments], W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., [illegible]. 61–73, 108–112, figs. 3*).—Tests were made in 1908, 1909, and 1910 with 84

varieties of potatoes but the yields secured, which are given in a table, are quite variable owing to seasonal conditions and the attacks of diseases and insects. Seed potatoes taken from weak hills were low in vitality and produced only small and irregular tubers. Seed tubers exposed to the sun and air for some time before planting did not give results showing definitely that the treatment had been beneficial. A table is given showing the comparative susceptibility to dry rot of the 84 varieties. The starch content and cooking and keeping qualities of the entire list is also shown in tabular form. Notes are given on the selection of seed potatoes, susceptibility to diseases, and elimination of dry rot. Varieties are enumerated with reference to drought resistance, insect attacks, and ripening period. Experiments begun with seedling potatoes are briefly mentioned, and tabular data are given on fertilizer trials from which definite conclusions could not be drawn.

Electrical treatment on potato crops, 1911, Miss E. C. Dudgeon (*Trans. and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc., 24 (1911–12), pp. 143–145*).—Previously noted (E. S. R., 26, p. 835) from another source.

Experiments with unsprouted and sprouted potatoes, M. Karel (*Fühling's Landw. Ztg., 61 (1912), No. 22, pp. 777–779*).—A report is given of experiments in which unsprouted seed potatoes gave larger yields than tubers that had been allowed to sprout and the sprouts either removed at planting time or allowed to remain. The yield from tubers from which the sprouts were not removed was larger if the tubers were strong and healthy than that from those from which the sprouts had been removed.

In order to get a quantity of plants from a single tuber, the tuber was removed from the sprout after it had been planted and the plant about 8 days above ground, and replanted to grow another set of plants. This method proved successful and is considered useful in the propagation of new varieties.

Rice culture in the Philippines, C. M. Conner (*Philippine Bur. Agr. Bul. 22, 1912, pp. 40, pls. 22*).—This bulletin describes the methods employed in the cultivation of rice, relates the work that is in progress in testing varieties, and gives a chapter on rice pests.

Rice in Cochin China, A. Coquerel (*Paddys et Riz de Cochinchine. Lyon, 1911, pp. VII+224, pls. 17*).—The author gives an account of the rice industry of the country under the headings of culture, hand and machine work, milling, improvement, exportation, revenues, and statistics.

Handbook on the sugar industry of the Philippine Islands, G. E. Nesom, H. S. Walker et al. (*Manila: Dept. Pub. Instr., 1912, pp. 87+145, pls. 36, figs. 15*).—Part 1 of this work on the sugar industry of the Philippine Islands takes up the subject under the following headings: Historic sketch of the sugar industry in the Philippines; sugar production in the Provinces outside of Negros; status of the sugar industry in the Provinces; climate and soil conditions; methods of cultivation, harvesting, transportation, milling, and chemical control; sugar cane pests and diseases; and statistics on sugar in the islands.

Part 2 on the sugar industry in the island of Negros has been previously noted (E. S. R., 26, p. 537).

The storage and marketing of sweet potatoes, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 520, pp. 16, figs. 10*).—This bulletin presents plans and directions for the construction of different types of storage houses for sweet potatoes, gives brief notes on the varieties most suitable for marketing, and describes the harvesting, storing, and marketing of the crop.

Effect of fertilizers on the physical and chemical properties of wheat, J. W. Ames, G. E. Boltz, and J. A. Stenius (*Ohio Sta. Bul. 243, pp. 567–587, figs. 11*).—The same varieties of wheat were grown in 1910 on plats of uniform

soil conditions, but under different manurial treatment since 1894. Four- and 5-year rotations were practiced and different amounts and combinations of commercial fertilizers and barnyard manures were applied.

Wheat grown on unfertilized soil, when the smallest yield of grain was obtained, contained 50 per cent of shriveled kernels, and increasing the nitrogen content of the soil accentuated this condition. Potassium increased the proportion of plump kernels, although the yield was the same as when nitrogen was applied to the soil and the composition was practically the same as that found in the wheat from unfertilized soil. Phosphorus improved the physical appearance of the grain to the greatest extent. The protein, carbohydrate, and phosphorus content of the wheat grain bore a complementary relation to each other, while an inverse ratio existed between the percentages of protein and carbohydrates. The phosphorus and carbohydrates stood in a direct ratio to each other. The largest percentages of phosphorus and carbohydrates were found in the best developed grain, which was in turn associated with the highest yields.

The percentage of protein was highest in wheat grown on soil deficient in phosphorus and well-supplied with available nitrogen. The relation between the carbohydrates and phosphorus on the one hand and protein on the other was influenced by the form in which the nitrogen was supplied, whether from organic or inorganic sources and by the ratio of phosphorus to nitrogen. The ratio of phosphorus to nitrogen in the wheat grain generally stood in the same order as the ratio of phosphorus to nitrogen supplied to the soil, and the percentages of gluten and gliadin stood in a direct relation to the total protein content of the wheat.

Preparing grains for seeding, E. SCHAFFNIT (*Fühling's Landw. Ztg., 61 (1912), No. 20, pp. 665–682, figs. 2*).—Methods of cleaning the seeds and treating with fungicides that may be practiced on the farm are described.

An experiment to determine the retarding effect of orwood on the germination of seeds, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 113–115, figs. 2*).—An experiment was conducted to determine the strength of a solution of this substance which may be used without injury to the grain. Solutions of different strength were used on 3 varieties each of oats and wheat. A solution of "orwood 1:4 in all 6 experiments retarded germination for several days." Oats were found less subject to injury than wheat.

The seed importation act of August 24, 1912 (*U. S. Dept. Agr., Office Secretary Circ. 42, pp. 6*).—This circular includes the text of the act (E. S. R., 27, p. 494), the rules and regulations for its enforcement, definitions of various terms and the names of the plants considered weeds.

References on plant breeding, C. FRUWIRTH (*Jour. Landw., 60 (1912), No. 2, pp. 151–181*).—Abstracts of 56 recent publications are given.

References to recent work in agriculture, C. FRUWIRTH (*Jour. Landw., 59 (1911), No. 4, pp. 375–406*).—Abstracts of 63 publications are presented.

Proceedings of the American Society of Agronomy, [1910] (*Proc. Amer. Soc. Agron., 2 (1910), pp. 154, pls. 6, figs. 22*).—This volume contains the complete minutes of the Washington meeting, November 14 and 15, 1910 (E. S. R., 24, p. 195), a list of members, and 15 of the 20 papers presented, as follows:

A Test of Planting Plats with the Same Ears of Corn to Secure Greater Uniformity in Yield, by T. L. Lyon; A Comparison of the Error in Yields of Wheat from Plats and from Single Rows in Multiple Series, by T. L. Lyon; Analysis of Yield in Cereals, by L. R. Waldron; Method of Keeping Crop Records at Michigan Station, by F. A. Spragg; The Work of the Committee on Seed Improvement of the Council of North American Grain Exchanges, by B. Ball; Methods for Testing the Seed Value of Light and Heavy Kernels in Cereals,

by E. G. Montgomery; Standardization of Field Experimental Methods in Agronomy, by C. V. Piper and W. H. Stevenson; Methods in Breeding Cereals for Rust Resistance, by E. C. Johnson; Interpretations of Results Noted in Experiments upon Cereal Cropping Methods after Soil Sterilization, by H. L. Bolley; Technical Terms in Agronomy, by C. R. Ball; Long Versus Short Periods of Transpiration in Plants Used as Indicators of Soil Fertility, by F. S. Harris; The Theory of Soil Management, by F. K. Cameron; Some Causes of Soil Granulation, by E. O. Fippin; Moisture and Nitrate Relations in Dry-Land Agriculture, by H. O. Buckman; and "Moisture Equivalent" Determinations and their Application, by L. J. Briggs and J. W. McLane.

Proceedings of the American Society of Agronomy, [1911] (*Proc. Amer. Soc. Agron., 3 (1911), pp. 286, pls. 4, figs. 51*).—Aside from the complete minutes of the meeting at Columbus, Ohio, November 13 and 14, 1911 (E. S. R., 26, p. 196), this report includes the following named articles:

Instruction in Farm Crops, by M. L. Fisher; The Relation of Protein Content of Wheat to Rainfall, by R. W. Thatcher; The Pure-Line Method of Breeding Drought-Resistant Wheats and Similar Cereals, by C. Salmon; The Inheritance and Effect of Sucker Production in Corn, by A. T. Wiancko; The Influence of the Soil Type on the Plant Variety, by J. L. Burgess; A Preliminary Report on a Field Study of Soil Moisture, by A. G. McCall and H. J. Bower; The Practical Classification of Soils, by E. O. Fippin; Some Experiments to Estimate Errors in Field Plat Tests, by T. L. Lyon; The Development of Soil Survey Work in the United States, with a Brief Reference to Foreign Countries, by G. N. Coffey; Transpiration of Wheat Seedlings as Affected by Soils, by Solutions of Different Densities, and by Various Chemical Compounds, by G. J. Bouyoucos; The Effect of Soil Moisture and Temperature on the Availability of Plant Nutrients in the Soil, by J. O. Morgan; Application of Wilting Coefficient Determinations in Agronomic Investigations, by L. J. Briggs and H. L. Shantz; and Methods of Determining the Water Requirements of Crops, by E. G. Montgomery.

HORTICULTURE.

Some factors influencing the efficiency of Bordeaux mixture, L. A. Hawkins (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 265, pp. 29, figs. 4*).—The first part of this paper describes comparative tests conducted to determine the effect on the rate of subsidence of the suspension of various methods advocated for preparing Bordeaux mixture. The second part of the paper describes experiments with different compounds added to Bordeaux mixture to increase its adhesiveness, and conducted in connection with spraying experiments for the control of the black rot of the grape in New Jersey and in Michigan. A bibliography of related studies is included.

The tests of various methods of preparing Bordeaux mixture have shown that a mixture in which the suspension of the copper compound settles out slowly may be prepared by adding the concentrated calcium hydroxid to the diluted copper sulphate solution or vice versa, provided the mixture is sufficiently agitated. Practically as good results were obtained with these methods of preparation as by diluting the 2 components in separate vessels and pouring them simultaneously into a third as recommended by Galloway (E. S. R., 8, p. 240). This method of mixing a concentrate and a dilute solution is not designed to replace the old gravity method with its elevated platform but offers a convenient substitute where for any reason the gravity method is impracticable. The author is of the opinion, however, that the agitation necessary for preparing Bordeaux mixture with a low rate of subsidence by this method can hardly be obtained in practice except by means of a power outfit provided with a good agitator.

In the experiments on the adhesiveness of certain Bordeaux mixtures and the relative value of certain adhesive compounds, it was shown by determining the quantity of copper retained on the leaves sprayed with the different mixtures that the addition of resin-fish oil soap slightly increases the adhesiveness of the mixture. Two lbs. of resin-fish oil soap to 50 gal. of mixture gave the best results and is recommended as the most economical and efficient adhesive for use on grape berries. From the results obtained it seems probable that with the addition of soap a 3:2:50 Bordeaux mixture would be effective in spraying grapes. A laboratory method of approximating the relative adhesiveness of these fungicides to grapes is here described.

Partial sterilization of soil for glasshouse work, E. J. RUSSELL and F. R. PETHERBRIDGE (*Jour. Bd. Agr. [London], 19 (1913), No. 10, pp. 809–827, pls. 5, fig. 1*).—Various appliances for partial sterilization by means of heat and the relative efficiency of different antiseptic treatments are discussed in this article.

Although none of the antiseptics used were as effective as heat, several were found to be superior to toluol, which has heretofore been used by the authors. The most effective group of substances used in the experiments included formaldehyde, pyridene, collidene, lutidene, etc. The search for still more effective antiseptics is to be continued.

Cheap antiseptics for use in horticulture and agriculture, E. J. RUSSELL (*Chem. World, 2 (1913), No. 2, pp. 41–43, figs. 2*).—This is a brief discussion of the subject more fully treated in the article noted above.

Manures for garden and farm crops, W. DYKE, edited by T. W. SANDERS (*London [1911], pp. 116, pl. 1, figs. 8*).—This is a popular handbook "dealing with manures and fertilizers, their nature and composition; adaptability to various soils; and their application to fruit, flower, vegetable, market garden, and farm crops; outdoor and indoor flowering plants, lawns, etc.; with special formulas for each."

The market garden: How to start and run it profitably (*London, 1913, pp. 188, figs. 15*).—A popular treatise on intensive gardening written by the gardening experts of The Smallholders' Union, London.

History of vegetables, G. GIBAULT (*Histoire des Légumes. Paris, 1912, pp. VIII+404, figs. 10*).—This work comprises historical accounts of vegetables cultivated in the temperate climate of Europe. The vegetables are grouped with special reference to the edible parts of the plants and discussed in alphabetical order.

[Variety tests of vegetables], W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 73–90, figs. 2*).—Notes and yield data are given of variety tests of different kinds of vegetables conducted at the Western Washington Substation in 1909 and 1910. Some data are also given showing the internal characteristics and variations in garden beets.

Methods used in breeding asparagus for rust resistance, J. B. NORTON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 263, pp. 60, pls. 18, figs. 4*).—This paper discusses the methods developed in the selection, pollination, and breeding of asparagus at Concord, Mass., in cooperation with the Massachusetts Station (E. S. R., 28, p. 339). The subject matter is discussed under the following general headings: Preliminary work, selection, breeding, bud propagation, pedigree, plans for distribution, and suggestions to breeders and growers. Introductory considerations deal with the history of asparagus rust and previous attempts to control it by spraying and breeding.

In making selections for rust resistance several acres of the best stock obtainable were used. From the different strains several hundred plants have been selected for pedigree testing after being subjected to attacks of rust.

Progeny tests of select plants have been made each season since 1909. The rust resistance and vigor of these seedlings have determined the value of the breeding parents, although the author finds that structural difference appears to bear a closer relation to rust resistance than vigor. The test male A7–83 and the test female B32–39 have given a very superior progeny which has proved satisfactory as a "commercially immune" type. This progeny has been named and plans are under way for its production in quantity. Breeders and growers are advised to take up pedigree breeding to produce good strains and to use careful methods in keeping rust out of producing fields.

Asparagus breeding, J. B. NORTON (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 440–444*).—This comprises a review of the author's breeding investigations through the season of 1911 (E. S. R., 28, p. 339), together with a discussion of methods employed in carrying out the work.

Strain tests of cabbage, C. E. MYERS (*Pennsylvania Sta. Bul. 119, pp. 15, figs. 3*).—In continuation of a previous test of Jersey Wakefield strains (E. S. R., 22, p. 640), the cabbage tests were extended in 1909 to include numerous strains of Jersey Wakefield, Charleston Wakefield, Early Spring, Early Summer, Danish Ballhead, Succession, Flat Dutch, Surehead, and Volga. The tests were conducted through the 3 seasons 1909 to 1911 and the data for each year are tabulated and discussed.

Although the attempt was made to test all strains under the same conditions, including a correction of differences in soil fertility, the data secured in these tests show important variations within varieties of cabbage. The average variation in yield for the tests as a whole was somewhat more than 7 tons per acre. The author attributes these differences to differences of inherent properties of the seed and emphasizes the importance of giving greater attention to heredity in the production of our economic plants.

Preliminary notes on pepper hybrids, H. J. WEBBER (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 188–199, figs. 8*).—This comprises a preliminary note on inheritance studies with peppers started in the summer of 1908. Consideration is here given to the first and second generation hybrids secured from 2 crosses with reference to size of leaf and fruit, color and position of fruit, flavor, color of young fruit, apex of fruit, and form of branching.

No definite conclusions or deductions have been made from the data thus far secured. In the series of hybrids secured from Red Chili x Golden Dawn there appears a striking instance of the apparent origination of a new character by hybridization. Both parents are medium-sized types in the pepper group. When the coarse branches of the male parent, Golden Dawn, are combined in the hybrid with the erect and many branches of the female parent, Red Chili, the result is a giant plant as compared with either parent. On the other hand, when the fine branches of the female parent are combined in the hybrid with the horizontal and few branches of the male parent, the result is a dwarf plant as compared with either of the parent forms. The author suggests that the appearance of these new characters is due to the recombination of the heredity units or genes of the parental types.

A Mendelian study of tomatoes, A. W. GILBERT (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 169–188, fig. 1*).—The author made a number of crosses in 1907 and 1908 to test the behavior of unit characters in tomato hybrids. A table of the crosses and their allelomorphic pairs together with brief data on the first and second generation hybrids are given, after which the crosses and their offspring are grouped and discussed with respect to similar allelomorphs regardless of variety.

The results of this investigation are summarized as follows:

"Tomatoes contain numerous separately heritable units which are inherited in alternative fashion without blending. Some characters, such as red and scarlet colors of fruit and tall vines, are completely dominant over their allelomorphs. Such characters as the size and shape of fruit are evidently made up of numerous unit characters. The gross appearance of the F_1 generation is a blend between the parents, but in the second generation types appear forming an almost complete series ranging from the large round parent to the small pear or plum-shaped one. Dominance and recessiveness depend upon the characters themselves and are independent of the races crossed. Complete segregation takes place, except possibly where size and shape are concerned, and the actual ratios of types produced are very close to the theoretical Mendelian ratios.

"A demonstration is afforded of the economic and commercial use of Mendelism. Desirable unit characters may be transferred from one plant to another almost at will. Mendelism has an unlimited commercial application. If a sufficient number of second-generation hybrids are used all possible combinations are produced and no new kinds are found in the third generation. The third-generation hybrids of these tomatoes, the data of which are not presented in this article, prove this."

Polymorphism in the stamens of the flowers of fruit trees, M. Novikov (*Selsk. Khoz. i Lĕsov., 239 (1912), Nos. 7, pp. 331–343; 8, pp. 470–481; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2630, 2631*).—The numerous researches of the author have demonstrated the fact that polymorphism in flowers constitutes a general rule for almond, apricot, peach, pear, plum, apple, and cherry trees. This is evidenced by the different lengths of the stamens and pistils and by the resulting relative positions of stigmas and anthers. In the rosaceous stone fruits the inner stamens, which are also the shortest, mature before the outer and longer ones, whereas in rosaceous plants with soft pericarp and free seeds the contrary is the rule. The author suggests the value of polymorphism in peach blooms as an aid in distinguishing and classifying the very numerous subvarieties.

Attention is called to the common phenomenon of flower doubling and the presence of forms which mark a gradual passage from stamens to petals. Although this tendency may lead to sterility in a great many cases, it is pointed out that in other cases the exuberant formation of petals diminishes but slightly the fruitfulness of the plant, as for instance in the Reine-Claude de Meroldt plum.

Apple breeding in Canada, W. T. Macoun (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 479–487*).—A review of apple breeding investigations in Canada dealing especially with investigations conducted by Saunders (E. S. R., 25, p. 643), and the author and others at the Central Experimental Farm, Ottawa (E. S. R., 27, p. 343).

Systematic botany of the plum as related to the breeding of new varieties, W. F. Wight (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 488–497*).—The author indicates the species of plums which have been utilized in horticulture and calls attention to many other native and Old World species which might be used to advantage in developing varieties of plums better suited to American conditions. The importance of a thorough knowledge of the relationships between species in order to secure successful hybrids is pointed out.

Mendelian inheritance in Prunus hybrids, S. A. Beach and T. J. Maney (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 214–226, figs. 12*).—This comprises a contribution to the knowledge of Mendelian inheritance in Prunus hybrids. Two general classes of F_2 Prunus hybrids produced by unguarded F_1

parents were under observation. One class is composed of sand cherry-cherry hybrids and the other of sand cherry-plum hybrids.

The inheritance of the characters of color of foliage, form of leaf, persistence of stipules, habit of tree growth, and immunity from plant lice are discussed and the correlation of certain characters is also noted. The sand cherry-cherry hybrids were originally secured by cross-pollinating the western sand cherry with pollen of the Montmorency cherry. The sand cherry-plum hybrids were secured by pollinating the Dwarf Rocky Mountain cherry with pollen of the Wyant plum.

The authors find that in both sets of hybrid plants the character of immunity from aphis is Mendelian. Susceptibility to aphis attacks is transmitted by both the Montmorency cherry and by the Wyant plum as a recessive character. It was observed that all of the F_2 hybrids of sand cherry x Montmorency which were infested with aphis and had leaves of the Montmorency type of base also had the Montmorency type of color of foliage. The converse, however, did not hold true. With a single exception all of the aphis-infested F_2 hybrids of sand cherry x Wyant which had foliage with the Wyant type of color also had leaves with the Wyant type of base, but the converse in this case did not hold true. The leaf of the exceptional plant referred to had an intermediate form of base favoring the sand cherry. Hybrid plants attacked by the aphis resembled in texture the Montmorency or Wyant, respectively, according to their parentage, while those which were immune from the aphis resembled the sand cherry most closely in form, color, and texture.

The influence of stock on scion and a case of dimorphism, J. Paelinck (*Tribune Hort.* [*Brussels*], 7 (*1912*), *No. 337, pp. 774, 775*).—The author describes a case in which the black heart cherry, Early Rivers variety, having dark red fruit, was grafted on mahaleb stock. As compared with the fruit of the parent, Early Rivers, the fruit from the resulting tree was changed in color to a yellowish white, matured some 8 days later, and was smaller. Scions from this white-fruited tree were then grafted on *Prunus avium*, mazzard stock having small black fruit, to see if the white fruits would revert to the dark color. The result was negative. As far as this one variety of black heart cherry is concerned, the use of mahaleb stock appears to have been detrimental to the fruit.

A case of dimorphism is also described in which a mauve colored autumn chrysanthemum gave a sport some 6 years ago which bore yellowish white flowers with greenish reflex toward the center. The new variety has thus far preserved the qualities of the parent plant.

In a third case observed by the author a white-flowered zonal geranium gave plants which bore clusters of white flowers and of brick-red flowers on the same plant. This variation is still maintained by asexual propagation.

Bud selections as a means of improving citrus and other fruits, A. D. Shamel (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 497–503*).—A paper on this subject based on the author's studies in the citrus groves of southern California (E. S. R., 25, p. 339; 27, p. 441), together with some observations on peach varieties in Connecticut.

Variation studies of the venation angles and leaf dimensions in Vitis, M. J. Dorsey (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 227–250, figs. 2*).—This comprises a statistical study of the variability and relationship of the leaf dimensions and of the angles of venation and their range of variability.

The author reviews the work of Ravaz, who made extensive use of the venation angles and the ratio of vein lengths in variety descriptions in his American Vines (E. S. R., 15, p. 585), as well as the investigations of Sacca, who found

(E. S. R., 22, p. 144), a correlation between the size of the angle formed by the midrib and the outer large vein at the base of the leaf and productivity.

Various measurements were made of leaves of different species to check up the results of the above investigators and a special study was made of the 2 species, *Vitis vulpina* and *V. bicolor*, to determine how constant the leaf dimensions and their relations were in individual vines within the species. A review of the work as a whole leads the author to conclude in substance that the leaf of vitis is quite variable in the different species and has in some species taxonomic characters which alone are sufficient for identification. The variation occurring in the angle of venation renders this character less valuable for taxonomic purposes where only slight differences occur between species or varieties. The limited data available indicate that the larger angle is dominant in crosses between 2 species. Owing to this influence, it is concluded that further study is needed to establish finally the correlation which Sacca believes to exist between the angle formed by the midrib and the second large lateral vein and productivity.

Within the species and the variety different individuals have distinct frequency distributions for the venation angles. Studies of the leaf dimensions of *V. bicolor* and *V. vulpina* show that the leaf of *V. bicolor* is larger, has a longer petiole in proportion to length of leaf, and a shorter leaf in proportion to its width.

Longavinbo and the mutation theory, T. V. MUNSON (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 444–448*).—An account of a composite hybrid of 6 species of grape, with the steps in its production and the results in each successive combination.

[Variety tests of fruits], W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 91–95*).—Notes are given on the growth, character, and behavior of different varieties of gooseberries, currants, blackberries, dewberries, raspberries, and strawberries being tested at the Western Washington Substation.

Plant breeding, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 115–118, fig. 1*).—A summarized account is given of hybridization work with blackberries, dewberries, raspberries, and the salmonberry conducted during 1909 and 1910, together with some data on color and seed characteristics of hybrid fruits secured in 1910.

Cacao culture, L. MARTINEZ (*Cultivo y Beneficio del Cacaotero. Mexico: Govt., 1912, 2. ed., pp. 72, pls. 16*).—This comprises a popular treatise on the history, botany, culture, preparation for market, and uses of cacao.

The palms, C. L. GATIN (*Les Palmiers. Paris, 1912, pp. III+338, figs. 46*).—This work treats of the natural and horticultural history of the different genera of palms. In part 1 consideration is given to the morphology, anatomy, reproduction, chemistry, classification, and distribution of palms. Part 2 discusses the propagation and culture of ornamental palms, both outdoors and under glass. The principal genera are also described. A list of palms growing in the French colonies and a bibliography are appended.

Report on a study of tea culture in Ceylon and British India, C. BERNARD (*Verslag over een Reis naar Ceylon en Britsch-Indië ter Bestudeering van de Theecultuur. [Buitenzorg]: Dept. Landb., Nijv. en Handel, [1912], pp. 112, pls. 16*).—This comprises the results of a survey on tea culture in Ceylon and British India, conducted under the direction of the Javanese government, with the view of familiarizing planters in the last-named country with cultural practices in the English colonies. The methods of culture, management, and preparation of tea for market are discussed in detail.

The Persian walnut industry of the United States, E. R. Lake (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 254, pp. 112, pls. 11, figs. 24*).—This comprises a practical treatise on Persian walnut culture, including also varietal descriptions and information in regard to various phases of the industry in the United States. The subject matter is discussed under the general headings of a description of the Persian walnut tree; the crop and its uses; distribution and areas of culture; climatic conditions required; soil requirements; factors in locating a walnut orchard; varieties and types of walnuts; propagation; planting, training, and pruning; cultivation of the orchard; pests and diseases; harvesting the crop and preparing it for market; and walnut growing as a business. A bibliography is appended.

Carnation breeding, L. D. Batchelor (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 199–205*).—Carnation hybridization studies started by the author in 1908 and here reported appear to confirm the theory advanced by Norton and also confirmed by Stuart (E. S. R., 28, p. 438) that the commercial carnation is a heterozygous or unfixed hybrid of the single x double carnation in which the single is recessive to the double. Reference is made to similar results secured by H. J. Webber with a lot of seedling carnations started by Norton. These results indicate from a practical standpoint that if the desired color and plant characters are obtained in individuals with either single or double flowers, they can be easily recombined in a hybrid of normal standard or commercial form and may be perpetuated by propagating from cuttings henceforth.

Smith's chrysanthemum manual, E. D. Smith ([*Adrian, Mich.*], *1913, 3. ed., pp. 106, figs. 39*).—A practical treatise on chrysanthemum culture intended for both florists and amateurs. The present edition has been revised and enlarged.

FORESTRY.

Report of the director of forestry for the year 1912, R. H. Campbell et al. (*Dept. Int. Canada Ann. Rpt. 1912, pt. 6, pp. VI+1–176, pl. 1, figs. 20*).—In addition to a general report on the work of the forestry branch for the year 1911–12, reports of officials in charge of forest reserves, tree plantations, grazing, fire protection, forest surveys, etc., are also given.

Annual report of committee on breeding nut and forest trees, G. B. Sudworth (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 250–255*).—This report comprises essentially an account of the general progress made by the Forest Service of this Department in tree breeding and in the introduction of exotics during the year 1910. The principal experiments noted include a test of western yellow pine and Douglas fir seed from different sources, experiments to extend the immediate natural range of forest trees, cultural tests of exotics at the Fremont Station, Colorado, and the introduction of cork oak seedlings into southern California and of maritime pine into Florida.

Report of committee on breeding nut and forest trees, G. B. Sudworth (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 515–522*).—This report surveys the main achievements in tree breeding accomplished at home and abroad during 1911. The subject matter is discussed under the general headings of sources of seed, studies of range extension, breeding new strains of basket willows, and theory of acclimatizing trees.

Forest seed collection to gain the benefits of environment, G. L. Clothier (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 522–525*).—In this paper the author points out some of the desirable effects of environment, the benefits of which may be gained by a proper regulation of forest seed collection.

Mechanical properties of western hemlock, O. P. M. Goss (*U. S. Dept. Agr., Forest Serv. Bul. 115, pp. 45, pls. 7, figs. 12*).—This bulletin presents the results of one of a series of mechanical tests of structural timbers which have been conducted by the Forest Service (E. S. R., 28, p. 50).

Various tests were made of hemlock bridge stringers and of small, clear pieces cut from the uninjured portions of tested stringers to show strength in bending, the compression parallel and perpendicular to the grain, shearing, shrinkage, and moisture content. A study was also made of the relation of defects, rate of growth, weight, and proportion of summerwood to the mechanical properties, and of strength as affected by seasoning. The results of the various tests are tabulated and discussed.

They show in general that western hemlock is well-suited for use in all but the heaviest construction work. Notes are given on its various uses at the present time, together with specifications and grading rules. Some data on bending and compression tests of small, clear sticks are appended.

Greenheart, C. D. Mell and W. D. Brush (*U. S. Dept. Agr., Forest Serv. Circ. 211, pp. 12, pls. 4*).—This circular comprises an account of greenheart (*Nectandra rodiæi*), a South American and West Indian tree noted for the lasting qualities of the mature wood. The subject matter is discussed under the following general headings: Importance of the wood, uses and durability, distribution, logging and transportation, market, the tree, gross and anatomical characters of the wood, and substitutes for greenheart.

Circassian walnut, G. B. Sudworth and C. D. Mell (*U. S. Dept. Agr., Forest Serv. Circ. 212, pp. 12, pls. 5*).—A discussion of the Circassian or English walnut (*Juglans regia*) with special reference to utilization of the wood. The following phases are discussed: Common names, uses, native and cultivated range, sources of supply, logging and transportation to market, waste in preparing logs for shipment, consumption of Circassian walnut in the United States, gross and minute characters of the wood, and substitutes.

The treatment of woods in France, C. Broilliard (*Le Traitement des Bois en France. Paris and Nancy, 1911, 3. ed., pp. XXI+685, pl. 1*).—A treatise on the valuation, division, and usufruct of forests.

Part 1 discusses the general administration of forests. The succeeding parts deal with the management of coppice, coppice with standards, even-aged high forests, and reforested areas. Consideration is also given to the structure and utilization of various species of timber and to the valuation of forests.

DISEASES OF PLANTS.

Diseases of plants, W. H. Lawrence (*Washington Sta. Bul. 7, spec. ser., pp. 95–102*).—Notes are given on observations made on various diseases of plants during the period from November, 1907, to April, 1911, when the author was connected with the Western Washington Substation. The notes include a report on the comparative value of some fungicides for controlling oat smut; smuts of oats, wheat, and barley; observations on apple scab, black-spot apple rot, crown rot of alfalfa, brown rot of prunes and cherries, and fruit rot of raspberries.

In a comparative test of the value of Orwood, a fungicide recommended for controlling oat smut, it was found that while it gave fairly good results, it was not as efficient as formalin for this purpose.

The author reports on the use of lime-sulphur mixture for the control of apple scab, and describes a rot of stored apples which proved quite destructive during the winter of 1911. The cause of the rot was not determined.

The crown rot of alfalfa and clover, due to *Sclerotinia trifoliorum*, is described at some length, observations having been made on the fungus at different times throughout the season.

The author records having observed in April, 1910, the apothecia of the brown rot of prunes and cherries developed from cherries lying on the surface of the ground or partially buried.

The fruit rot of raspberries, which was first noticed in 1902, became very troublesome in 1910, and from reports received it appeared that from 25 to 30 per cent of the fruit in some fields was destroyed. A study was made of the disease, which is apparently due to some fungus, and it was found that not only the fruit but also the buds and fruiting branches were attacked. Different varieties of raspberries and loganberries varied in susceptibility to the disease.

Work connected with insect and fungus pests and their control, J. C. MOORE (*Rpt. Agr. Dept. St. Lucia, 1911–12, pp. 9–11*).—The author briefly reports upon the occurrence of a number of diseases of economic plants, among them the root disease and red rot fungus of sugar cane, diseases of cacao, bananas, limes, coconuts, etc.

The root disease of cacao is said to be causing some anxiety on account of its spread, and a list is given of host plants known to be attacked by the same fungus. The roots of many of the plants, however, were found to be in contact with diseased roots of cacao, and it is possible that they may not regularly be hosts of the fungus.

In connection with the banana disease, which is not definitely determined but which is reported as that particularly attacking the Gros Michel variety, the author notes several varieties as only moderately susceptible or comparatively resistant, and experiments are in progress to determine the degree of resistance.

The gray fungus (*Thelephora pedicellata*), noted previously (E. S. R., 27, p. 445) as occurring on limes, has not proved to be a cause of serious damage.

An unidentified fungus is reported on the pod of the Lyon bean (*Stizolobium niveum*) grown at the experiment station, and the presence of *Hypochrella oxyspora* on the Java plum (*Eugenia jambolana*) is reported, where the fungus is causing some injury to the leaves.

[Plant diseases, 1911], R. SCHANDER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1912), No. 1, pp. 53–72*).—Besides reporting on several related studies, the author gives a brief account of some investigations carried out in 1911 on leaf spot of cereals, the physiology of *Phoma betæ*, the loose smut of barley and wheat, various potato diseases, leaf roll of tomatoes, Cuscuta, and *Heterodera schachtii* affecting beets and grains.

[Diseases and vegetable parasites, 1911], G. BRIOSI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 4–6, pp. 30–40*).—This is a condensed report from the Pavia station of cryptogamic botany on diseases and plant parasites observed during 1911.

Culturing of parasitic fungi on the living host, I. E. MELHUS (*Phytopathology, 2 (1912), No. 5, pp. 197–203, pl. 1, figs. 2*).—The author describes a method of infecting plants with parasitic fungi, and gives briefly an account of cultural studies with a number of species that he has successfully grown upon living plants.

Studies of fungus parasites belonging to the genus Glomerella, C. L. SHEAR and ANNA K. WOOD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 252, pp. 110, pls. 18, figs. 4*).—This bulletin gives a detailed account of investigations previously reported (E. S. R., 26, p. 645). The life histories and relationships as well as the physiological and pathological characteristics of the organisms from 36 different host plants are described.

Summarizing their investigations, the authors claim that most cultivated fruits as well as many other economic plants are attacked by fungus parasites of the genus Glomerella. These fungi pass through three stages in the course of their complete development and produce three kinds of spores, conidia, ascospores, and chlamydospores. The conidial stage is most frequently observed, and it is estimated that about 500 species of Gloeosporium and Colletotrichum probably belong to the genus Glomerella. Most of the forms studied indicate that there are neither morphological nor physiological differences sufficient for their segregation, all of the material from the 36 hosts belonging to the three species *Glomerella cingulata*, *G. gossypii*, and *G. lindemuthianum*. Detailed accounts are given of the results of inoculation experiments, upon which are based the conclusions drawn by the authors.

A bibliography is appended.

Infection experiments with conidia of Claviceps, R. Stäger (*Mycol. Centbl., 1 (1912), No. 7–8, pp. 198–201*).—The author claims to have demonstrated by experiments that summer spores of *C. purpurea*, which have lived over winter, still possess when 10 months old their full power of germination and infection.

A new Urocystis, P. Magnus (*Ber. Deut. Bot. Gesell., 30 (1912), No. 6, pp. 290–293, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2099*).—The author figures and describes a fungus said to be new and to cause a smut of *Melica cupani*. The parasite attacks the leaves and flowers, and the name *U. bornmülleri* has been given it.

Mechanical estimation of resistance of grains to disease and injuries, F. Stranák (*Ztschr. Gesam. Getreidew., 4 (1912), No. 2, pp. 37–41, fig. 1; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–24, pp. 497, 498*).—The substance of this has already been noted (E. S. R., 25, p. 244).

Degree of infection by Fusarium in recent years, L. Hiltner and Gentner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 9, pp. 99–101*).—The authors, in pursuance of previous reports (E. S. R., 27, p. 351), give tabulated figures obtained from examinations made on infection of both winter and summer grains for 1909–10, 1910–11, and 1911–12, and recommend a more general use of corrosive sublimate in treatment of seed.

Dipping seed for winter grains, L. Hiltner (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 9, pp. 97, 98*).—The author reports some good results from the treatment of rye seed with corrosive sublimate solution as protection against Fusarium. A like treatment after the plan indicated is also recommended to prevent stinking smut in winter wheat. Sublimoform, containing both corrosive sublimate and formaldehyde, is favored. In case of very sensitive varieties, as Squarehead, a mixture called blue sublimoform, consisting of the sublimate, copper sulphate, and formalin, is recommended. Estimates of comparative cost are given. See also a previous note (E. S. R., 27, p. 351).

Experiments for the prevention of stem smut of rye, F. K. Ravn (*Tidsskr. Landbr. Planteavl, 19 (1912), No. 2, pp. 214–228*).—By the hot-water method (immersion in water of about 54° C. for 5 minutes, with 20 dippings, without previous treatment, and with immediate cooling) the percentage of smut was reduced from 16 to 2, and the yields were increased by 250 kg. of grain and 360 kg. straw per hectare (about 222.5 and 320.4 lbs. per acre). By the formaldehyde treatment (sprinkling with from 0.1 to 0.13 per cent solution and leaving the pile for from 10 to 12 hours) a reduction to 1 per cent was secured and an increase in yield of 310 kg. grain and 430 kg. straw per hectare.

The severity of the attack of the stem smut depends on the time of sowing, being greatest with early sowing. Treatment for smut is therefore most important in the case of early sowing, but as it will also prevent other diseases

that appear especially with late sowing there is every reason always to recommend it for rye, whether this is sown early or late.

Some observations on stinking smut in wheat, W. OETKEN (*Deut. Landw. Presse, 39 (1912), No. 70, pp. 803, 804*).—The author reports that throughout large districts of Saxony both winter and summer wheat were attacked by stinking smut, the degree of severity varying with the seed, kind of soil, and time of planting. All varieties sown on March 27 showed a much higher degree of infection than did the same sorts sown 22 days later. The high percentages shown in the spring sowings are ascribed to a concurrence of conditions particularly favorable to smut infection in 1912.

Clover canker, E. HASELHOFF (*Illus. Landw. Ztg., 32 (1912), No. 45, p. 416; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–24, p. 535*).—The author describes a canker affecting several varieties of clover due to a fungus not named. No specific remedy is given, but plowing under and rotation with nonsusceptible crops are recommended.

The comparative susceptibility of cruciferous plants to Plasmodiophora brassicæ, G. C. CUNNINGHAM (*Phytopathology, 2 (1912), No. 4, pp. 138–142; abs. in Jour. Bd. Agr. [London], 19 (1912), No. 8, pp. 668, 669*).—In the spring and summer of 1911 the author carried on experiments near the Vermont Experiment Station on a tract of land which had become badly infected with club root from the continued cultivation of varieties of *Brassica oleracea* to determine the relative susceptibility of other cruciferous plants. Seeds of as many varieties of crucifers as possible were obtained and sown upon the infected soil, and at intervals they were examined for the appearance, nature, and extent of the disease.

The results of the examination are given in tabular form, from which it appears that there is a wide range of susceptibility among the Cruciferæ, not only among the different genera but also among the species within the genera and to an equal extent the varieties of the same species. One variety of *B. oleracea* showed 100 per cent of plants badly infected, while *B. rapa* showed only 1.1 per cent diseased. A similar condition was found to obtain with other species. In the case of cabbages one variety showed a susceptibility of 100 per cent as compared with 73.5 with another. The same was true among varieties of radishes, indicating, from the wide range of susceptibility, that there may be some varieties more resistant to this parasite than the ones commonly cultivated.

On the present status of the beet nematode question, R. SCHANDER and M. WOLFF (*Deut. Zuckerindus., 37 (1912), No. 7, pp. 157, 158; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–24, pp. 537, 538*).—Discussions are given which cover briefly the history of investigations on beet nematode injury, the biology of *Heterodera schachtii*, the nature and tendency of injury exhibited, and modes of combating the ravages inflicted so far as yet worked out.

Infection experiments with Thielavia basicola on ginseng, J. ROSENBAUM (*Phytopathology, 2 (1912), No. 5, pp. 191–196, pls. 2*).—In this paper the author reports inoculation experiments with *T. basicola* obtained from different host plants to determine its relations with one of the most common and serious diseases affecting ginseng.

From a comparison of the cultures from different hosts and from infection experiments it appears that the forms of *T. basicola* found on cotton, tobacco, and ginseng are identical. It was found possible to infect ginseng and tobacco without previous injury to the young plants, but when older plants were used infection did not always follow. In experiments with ginseng the fungus was found able to attack the aerial as well as the underground parts of the plant.

A disease of potatoes new in Italy (Cercospora concors), A. TONELLI (*Riv. Agr. [Parma], 18 (1912), No. 46, pp. 724, 725*).—The author briefly describes a disease of potatoes, ascribed to *C. concors*, only recently noted in restricted portions of northern Italy. Dry dark spots on the upper side of the leaf correspond to violet-gray spots on the lower side. The latter are due to the fruiting organs of the fungus. Its mycelium ramifies in the leaf, which dries out, checking the growth of the tubers and materially diminishing the potato crop within the areas affected.

Does the potato scab organism survive passage through the digestive tract of domestic animals? W. J. MORSE (*Phytopathology, 2 (1912), No. 4, pp. 146–149, pl. 1*).—According to the author, it has been repeatedly demonstrated that the application of fresh stable manure to the soil immediately before planting often tends to increase the amount of scab on the resulting potato crop. From this the question has arisen whether it is safe to feed uncooked potatoes or potato refuse to animals in stalls without taking precautions to prevent uneaten portions from becoming mixed with the litter.

Experiments were carried on in 1910 and 1911 with a horse and a cow fed infected potatoes, and the results indicate that the germs of potato scab are able to pass through the digestive tract of both species and go into the manure pile without being destroyed. This was much more readily the case with the horse than with the cow. The manure of horses fed on raw potatoes is very likely to carry the germs of the disease. On the other hand, that from cows fed a moderate quantity of potatoes is probably not a serious source of contamination.

Diaporthe, the ascogenous form of sweet potato dry rot, L. L. HARTER and ETHEL C. FIELD (*Phytopathology, 2 (1912), No. 3, pp. 121–124, figs. 4*).—The authors report upon a study of specimens of sweet potatoes showing the typical dry rot described by Halsted (E. S. R., 2, p. 416), where it is attributed to *Phoma batatæ*.

As a result of their study two strains of the fungus were obtained, and a careful investigation indicates that the pycnidial form does not belong to the genus Phoma. According to present classification it is thought more probably it should be referred to Phomopsis.

The characters of the ascogenous form of the fungus are described under the name *D. batatatis* n. sp.

Fruit tree enemies, Z. KAMERLING (*Bol. Min. Agr., Indus. e Com. [Brazil], 1 (1912), No. 2, pp. 58–62, pls. 4*).—This is a study of the influence of parasitic plants (Loranthaceae) upon their hosts. Two branches of mistletoe were found to show a higher rate of evaporation, expressed in percentage of their dry weight, than were given by two branches of guava under similar conditions.

Apple leaf spot, C. BROOKS and MARGARET DE MERITT (*Phytopathology, 2 (1912), No. 5, pp. 181–190, pl. 1*).—The effect of this fungus on the fruit and the relation of limb cankers to the spread of the disease to the leaves and fruit have been previously noted (E. S. R., 27, p. 651). In the present paper a report is given on the nature of apple leaf spot, on inoculation experiments to determine its cause, and on methods of control.

The apple leaf spot as it occurs in New Hampshire orchards is largely due to *Sphæropsis malorum*. Several strains of this species may be obtained, varying in vigor and in power to produce diseased conditions. A large-spored form is principally responsible for the production of leaf spot. It is said that infection may occur from the time the leaves unfold until the last of August.

Experiments on the control of this disease, which included cutting out the cankers, plowing under the leaves, and spraying with Bordeaux mixture or lime sulphur showed that these methods are important in its control.

Watery apples, H. REICHE (*Deut. Obstbau Ztg., 1912, No. 1, pp. 16, 17; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–40, p. 544*).—The author reports his observations tending to show, it is claimed, that the glassy appearance of apples is produced by too strong manuring and too much moisture in the soil.

Watery or glassy appearance in apples, R. BOTHE (*Deut. Obstbau Ztg., 1912, No. 1, p. 16; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20–24, p. 544*).—Observations in 1911 led the author to the conclusion that excessive heat, as well as excessive moisture or manuring, plays a part in this disease. The glassy appearance showed at first in a small spot resembling frost injury, but spread rapidly. On sectioning the apples the cells appeared brown and soft. A considerable amount of injury due to this disease was noted.

Studies in gummosis and frost influence on cherry trees.—III, The artificial production of gummosis, P. SORAUER (*Landw. Jahrb., 42 (1912), No. 5, pp. 719–750, pl. 1*).—Continuing previous work (E. S. R., 27, p. 851), the author presents the results of further experiments and observations with some suggestions.

In attempts to produce gummosis by artificial means it was found that a 5 per cent solution of ammonium sulphate placed beneath the bark of a healthy cherry tree produced a pronounced case of gummosis. The same result followed the introduction of oxalic acid, but such effect of this acid could be prevented or checked by addition of lime. Gummosis was not produced by employment of sulphuric acid or of any of several other salts tested. It is suggested that gummosis results from a sort of poisoning of the tissues by the chemicals used. In these experiments it is said that the growth of the twigs was accelerated but their maturity was retarded. This prolongation of the younger stage of the tissues, the increase and prolongation of activity of the tannic acid and cytase, and the depression of the pectase content may favor or condition the production of gummosis.

A new leaf rust of peach, S. HORI (*Phytopathology, 2 (1912), No. 4, pp. 143–145, pls. 2*).—The author describes a rust of the peach which is characterized by its white teleutosori, which distinguish it from the brown leaf rust (*Puccinia pruni-spinosæ*) and yellow leaf rust (*P. cerasi*). The disease is usually confined to the leaves, which at first exhibit small purplish-brown spots. Later the spots change to light brown, and toward the end of October the leaves exhibit the white pustules mentioned above. The leaves soon become a yellowish brown and fall at the slightest touch. The trees become defoliated early in the season, the fruit is of poor quality, and the wood not properly matured.

The fungus, which is described as a new species, is given the name *P. pruni-persicæ*.

The cause of the stem-end rot of citrus fruits, H. S. FAWCETT (*Phytopathology, 2 (1912), No. 3, pp. 109–113, pls. 2*).—In this paper the results of inoculation and other experiments are given which led to the determination of the cause of this rot as the fungus *Phomopsis citri* n. sp. Preliminary notes have been given on the disease (E. S. R., 27, p. 350).

A new internal Sterigmatocystis rot of pomegranates, S. M. MCMURRAN (*Phytopathology, 2 (1912), No. 3, pp. 125, 126*).—A serious pomegranate disease in various parts of the United States was reported in 1910 and 1911, and early in November of last year a number of fruits were examined in this Department which showed a central cavity occupied by a black spore-forming fungus. Except in one instance, no external indication of decay was present. The fungus was isolated and determined to be *S. castanea*.

The author states that as the fungus generally shows no connection with the rind in the earlier stages of the disease it is probable that the spores must

gain entrance to the flower while the calyx is open. Experiments on the control of the disease are to be carried on to determine the accuracy of this view.

Observations on diseases of grapes in Sicily, L. PETRI (*Bol. Min. Agr., Indus. e Com.* [*Rome*], *Ser. C, 9 (1910), I, No. 11, pp. 1–16, pl. 1, figs. 3; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 35 (1912), No. 20–24, p. 550*).—According to the author's observations, the disorders exhibited by Sicilian grape vines may be divided into four groups. Roncet constitutes the central disease of the first of these, being often complicated with such phases as root rot, insect injuries, etc. A second group is marked by no particular deformation, but by a retrogression and yellowing, often accompanied by root rot; the cause appearing to be poor condition of soil, as excessive moisture, clamminess, etc. The third group appears in extended depressed spots in the vineyards, and seems to be connected with the presence of phylloxera. The fourth disease is also found in depressions and is ascribed principally to *Rhizœcus falcifer*. In connection with each group, details are given and the effects upon different varieties are discussed.

Frizzle disease (court-noué) of grape, F. KOBER (*Allg. Wein Ztg., 29 (1912), p. 302; abs. in Centbl. Bakt.* [*etc.*], *2. Abt., 35 (1912), No. 20–24, p. 551*).—The author states that a disease of grapevines occurring near Mödling, Lower Austria, producing an appearance not unlike that due to roncet, was successfully treated during 1911 and 1912 by removal of the parts affected, the free use of sulphur in summer, and in the following spring the application of 4 per cent solution of lysol carefully painted on. The stocks not treated showed the disorder in high degree. The injury had been ascribed to the presence of *Phylloxoptes vitis*.

The life requirements of Peronospora as to weather, F. SÁVOLY (*Centbl. Bakt.* [*etc*], *2. Abt., 35 (1912), No. 17–19, pp. 466–473*).—This is an attempt to combine mathematically the factors operative in the development of Peronospora, as shown by observations, so as to express approximately the probable time of its appearance in vineyards.

Experiments on the pathological action of roncet, L. PETRI (*Bol. Min. Agr., Indus. e Com.* [*Rome*], *Ser. C, 11 (1912), No. 4–6, p. 15*).—In connection with the claim (E. S. R., 28, p. 245) that roncet may be transmitted by grafting and with the hypothesis that this takes place by the agency of the sap, the author arranged some sound grafts on stocks affected with roncet so that the grafts while not in actual physical contact with the stocks, were bathed in their exuding sap, which was guarded from contamination. It is said that the shoots when developed showed the appearances characteristic of roncet.

In some other observations made by the author, the results seemed to show that some varieties of grapes possess a high degree of resistance to roncet.

The pathological significance of the endocellular fibers in grapevines affected with roncet, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 1, pp. 113–119; abs. in Internat. Inst. Agr.* [*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2091–2093*).—Continuing the above investigations on roncet, the author investigated the alleged effect of cold in the production of this disorder by subjecting young ungrafted potted vines from 8 to 15 times during 38 days to temperatures ranging as low as 5, 3, 0, and in exceptional cases —1° C., the outside temperature attaining sometimes about 30° C. in the sunshine.

Plants already affected with roncet showed increase of fibers in the xylem formed after the beginning of the experiment, and also formed fibers in the epidermal cells. Healthy vines for the first time formed the endocellular fibers said to be characteristic of roncet in the new growth appearing during the cooling period; but the characteristic court noué was not produced, and the young vines showing these fibers appeared as healthy as others. Attention is

called to the fact that the formation of these fibers takes place in the vicinity of the nucleus.

The suggestion is made that the mild Italian winters, with short periods of cold in spring and fall while the tissues are growing and in a sensitive condition, may favor the formation of these fibers and the accompanying changes, their appearance being further favored by both local conditions of growth and constitutional peculiarities, the changes in protoplasm and sap being transmitted to the new growth in its first stage of formation.

Notes on three species of rust on Andropogon, W. H. Long (*Phytopathology, 2 (1912), No. 4, pp. 164–171*).—An account is given of the results of inoculation experiments on various species of Viola with *Puccinia ellisiana* from *A. virginicus*, *Uromyces andropogonis* from the same species, and with *P. ellisiana* and *U. andropogonis* from violets sown on *A. virginicus*. The author shows the alternate host plants for the different species, and also discusses the relation of the æcidia on Oxalis to the Puccinia on Andropogon.

Exobasidium on Azalea, P. Baccarini (*Bul. Soc. Bot. Ital., 1912, No. 6, pp. 127, 128; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2099*).—The author reports serious damage done by the recent appearance of undetermined species of Exobasidium on leaves of Azalea near Florence. This disease is said to have been seen in Holland in 1906, near Rome in 1907, and in parts of Germany in 1908. It is thought to have spread from Holland through the trade in azaleas, which has its chief center in that country.

Wood rots of the hardy catalpa, N. E. Stevens (*Phytopathology, 2 (1912), No. 3, pp. 114–119, pl. 1, fig. 1*).—In continuation of investigations on the wood rots of catalpa (E. S. R., 27, p. 752), the author reports finding sporophores of *Polystictus versicolor* on dead timber of the hardy catalpa. In a study of this tree in Kansas he found at least 4 species, *P. versicolor*, *Polyporus adustus*, *Schizophyllum commune*, and *Stereum albobadium*, on dead timber or on that which had been cut for some years.

P. versicolor is considered much more destructive under ordinary conditions than the others. In experiments with plugs of wood inoculated with fungi and placed in test tubes, *P. versicolor* occasioned a loss of 59 per cent of the original weight of the wood in 6 months, while under the same conditions *S. commune* caused a loss of only 37 per cent of the original weight.

The chestnut blight fungus and a related saprophyte, P. J. and H. W. Anderson (*Phytopathology, 2 (1912), No. 5, pp. 204–210*).—A detailed account is given of a saprophytic form of the chestnut blight fungus which has been observed in southwestern Pennsylvania (E. S. R., 28, p. 153). The morphological, cultural, and pathological differences are described at some length and the distribution of the saprophytic form indicated. The article concludes with a discussion of the taxonomic relations of this species with that which is held to be the cause of the chestnut blight, *Diaporthe parasitica*.

The chestnut blight fungus, C. L. Shear (*Phytopathology, 2 (1912), No. 5, pp. 211, 212*).—The author has made a study of the fungus in Europe, and as a result he is of the opinion that *Diaporthe parasitica* is the same as *Endothia radicalis* of European authors. It is thought probable that it was introduced into this country from Europe and has gradually spread from the original point of introduction, its spread being facilitated chiefly by borers or other animal agencies which produce wounds favorable for infection by the fungus. Its attack on the American chestnut is believed to be due to the greater susceptibility of species in this country.

On the nature of nonparasitic witches' brooms, K. von Tubeuf (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 1, pp. 62–64, fig. 1; abs. in Centbl. Bakt.*

[*etc.*], *2. Abt., 35 (1912), No. 20–24, p. 576*).—Continuing previous studies (E. S. R., 24, p. 453), the author investigated anew several conifers showing witches' brooms, but was still unable to find bacteria as the probable cause of the phenomenon, which he holds to be the result of mutation.

A Botrytis on conifers in the Northwest, J. R. Weir (*Phytopathology, 2 (1912), No. 5, p. 215*).—A brief account is given of a species of Botrytis which resembles *B. douglasii*. It was noted as a serious disease on the young terminal shoots of Douglas fir, young shoots of *Abies grandis* and *Tsuga heterophylla*, and young seedlings of *Larix occidentalis*.

Œdema on Manihot, F. A. Wolf and F. E. Lloyd (*Phytopathology, 2 (1912), No. 4, pp. 131–134, pl. 1, fig. 1*).—Attention was directed to a diseased condition of certain species of Manihot, commonly known as Ceara, growing in the greenhouse at the experiment station at Auburn, Ala. The leaves of a number of the plants showed peculiar glistening, prominent elevations, which occurred on either surface of the leaf. Sections through the affected areas showed no fungus, but there was a considerable enlargement and distortion of the cells, resulting in a condition generally described as that of œdema.

Various views regarding the cause of this trouble are presented, and attention is called to the presence of the disease in the hope of receiving information concerning the occurrence of a similar trouble on Ceara grown in the field.

Bacterium prodigiosum causing red specks on fresh rubber, P. Arens (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 17–19, pp. 465, 466*).—The author claims to have shown by isolation and infection experiments that the red specks observed on freshly prepared India rubber are due to the presence of *B. prodigiosum*.

The chemistry and fungicidal action of Bordeaux mixture, C. T. Gimingham (*Chem. World, 1 (1912), No. 11, pp. 363, 364*).—The author gives the results of a study of the chemistry and fungicidal action of Bordeaux mixture, paying particular attention to the processes by which the copper deposit is made soluble upon the leaves. He finds in practice that there will be comparatively little soluble copper produced by the action of carbon dioxid in the air, and that while fungi may exert a solvent action sufficiently strong to kill an individual spore yet no general fungicidal action would come from such a means. His studies seem to indicate that most of the solvent action is due to exudations from injured foliage and that this must be taken into consideration in connection with scorching and other injury which often follows spraying.

In conclusion the author states that the most important factors concerned in the fungicidal action of Bordeaux mixture are not those by which soluble copper is produced, but that the actual contact, or close association between the fungus and the particles of the insoluble copper compound, is the chief means by which the mixture is effective.

The action of copper sulphate as fungicide, C. Campbell (*Riv. Patol. Veg., 6 (1912), No. 15, pp. 225–229*).—The author calls attention to the value of sulphate of copper combined with soap as used against Peronospora on grapevines, citing experiments by himself and others in support of a statement that this mixture is an effective and economical fungicide and that in fairly large doses it favors the physiological processes causing an increase in the yield. He employed a mixture of 0.5 per cent copper sulphate with three times as much soap in water, except for a first spraying or for a spray applied soon after flowering, when 0.3 per cent of the copper salt with a corresponding proportion of soap was used. The results are claimed to be more satisfactory than those from Bordeaux mixture as to spreading and sticking qualities, as protection against Peronospora, and in stimulating the plant to greater yield.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Annual report of the governor of Alaska on the Alaska game law, 1912, W. E. CLARK (*U. S. Dept. Agr., Bur. Biol. Survey Circ. 90, pp. 14*).—This report discusses the relative abundance of game, administration, hunting licenses, shipping licenses, receipts, and game or trophies shipped from Alaska. An address list of game wardens and licensed guides, information for the public in regard to the Alaska game law, and the regulations promulgated are appended.

Experiments in trapping moles, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 120, 121*).—The author finds that as a general rule the most effective work is done during the early spring. His observations and experience have shown that it is a mistake to remove a trap from a runway as soon as a single mole is captured.

The cause determining the selection of food in some herbivorous insects, E. VERSCHAFFELT (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 13 (1910), pt. 1, pp. 536–542*).—This discussion relates particularly to *Pieris brassicæ* and *P. rapæ*, a leaf wasp (*Priophorus padi*) the larvæ of which live at the expense of the leaves of various Rosaceæ, and a beetle (*Gastroidea viridula*), the larvæ and adults of which feed on the leaves of a species of Rumex.

Injurious insects, how to recognize and control them, W. C. O'KANE (*New York, 1912, pp. XI+414, pl. 1, figs. 606*).—The first part of this work (pp. 1–51) deals with the structure, habits, and classification of insects; the second part (pp. 53–104) with the methods of insect control; and the third part (pp. 105–379) with injurious insects. The more important insect pests are dealt with under the headings of insect pests of garden and field crops, orchard and small fruits, household and stored products, and domestic animals. In each of the first two groups the various species are arranged according to the place where they are found at work. It is stated that all the illustrations are original, having been prepared from photographs by the author.

Twelfth report of the state entomologist of Connecticut for the year 1912, W. E. BRITTON (*Connecticut Sta. Rpt. 1912, pt. 3, pp. VIII+209–296, pls. 16*).—The first part of this report briefly discusses the chief lines of work carried on during the year, entomological features of 1912, and the inspection of Connecticut nurseries and apiaries.

The Inspection of Imported Nursery Stock in Connecticut (pp. 220–223) is reported upon by W. E. Britton and B. H. Walden; Gipsy Moth Control Work in 1912 (pp. 224–229) and Controlling the Brown-Tail Moth in 1912 (pp. 229–236) are reported upon by W. E. Britton and D. J. Caffrey; and A New Sawfly Pest of the Blackberry (*Pamphilius dentatus*), including a discussion of its life history and habits, and technical descriptions of its several stages (pp. 236–240), by B. H. Walden. The author is unable to state at the present time whether or not this pest will prove to be a serious enemy of blackberries.

A paper on The Life History and Habits of the Walnut Weevil or Curculio (*Conotrachelus juglandis*), by W. E. Britton and H. B. Kirk (pp. 240–253), includes a discussion of previous knowledge of the walnut weevil, its injury and abundance, technical descriptions of its several stages, food plants, control methods, distribution in North America, and a bibliography of 11 titles. In Connecticut the injury caused by the adults and larvæ is confined entirely to the new growth and nuts, it causing the stems in extreme cases to be killed entirely back to the old wood and the nuts to fall before maturing. "The adults do their chief damage early in the spring, making large punctures, some of which cut half way through the leaf stems and young shoots, causing them to wilt and die, and although the main injury is done by the larvæ, the adult injury

would be worth considering. The larvæ work first in the young shoots and later, as the stems grow, in the petioles of the leaves, in the leaf stems, or in fact any part of the new growth large enough to accommodate the larvæ. This injury to the new shoots by the larvæ, most severe in early summer and up to the middle of June, has been so great in the plantations . . . at Stamford and also with the trees at Lyme, as to wholly prevent the owners from obtaining a crop of nuts." This weevil appears to occur throughout the eastern half of the United States and Canada, though in a large portion of this territory it is not abundant and is not considered an important pest.

The walnut bud moth (*Acrobasis caryæ* Grote?) is briefly discussed by H. B. Kirk (pp. 253–258). Examinations made at Stamford in connection with studies of the walnut weevil showed the larvæ of the walnut bud moth to be tunneling in the buds and new shoots and causing fully as much damage as the walnut weevil. At Stamford the damage to the Persian walnut (*Juglans regia*) was greater than that of the walnut weevil, and in a number of cases the young trees were killed in a very short time. The young butternuts, black walnuts, and several varieties of *J. regia* were damaged seriously. So far as could be determined it does not attack, or at least does not seriously injure, any of the other species of Juglans.

There are said to be at least 3 generations each season. The eggs are laid singly around the base of the bud and sometimes on the leaves. The larval habits of this insect are quite varied since they feed on buds, leaves, and stems. The nests, which are the most conspicuous evidence of the presence of this insect, contain most of the pupæ. The tachinid fly *Exorista pyste* was reared from second brood larvæ. On trees sprayed with lead arsenate, 6 lbs. in 50 gal. of water, for the adults of the walnut weevil, no budworm injury was noticed.

A paper on The Mosquito Plague of the Connecticut Coast Region and How to Control It, which follows (pp. 259–283), has been previously noted as Bulletin 173 (E. S. R., 27, p. 559). An Outbreak of the Fall Army Worm is next reported upon (pp. 284–287). On September 3, larvæ were received from Stonington, where they were found devouring the grass of a lawn, and on September 10 from New Haven where they were also taken from a lawn. Serious Injury by White Grubs is described (pp. 288–291), their injury in 1912 having far exceeded that of 1909 as previously reported (E. S. R., 23, p. 361). Cultivated crops such as strawberries, corn, and even potatoes, as well as grass, were badly injured.

The report concludes with Miscellaneous Insect Notes, relating to a gall-making beetle of the hop hornbeam, identified as *Agrilus champlaini;* the spruce bud moth (*Tortrix fumiferana*); a chrysomelid beetle on English ivy imported from Europe, identified as *Agelastica* (*Galeruca*) *alni;* the southern cabbage butterfly in Connecticut; *Tolype velleda,* unusually common; the elm sawfly (*Cimbex americana*); the potato aphid (*Macrosiphum* (*Nectarophora*) *solanifolii*); tulip tree scale (*Toumeyella liriodendri*); juniper webworm (*Phalonia rutilana*); the garden milliped or "thousand legs" (*Julus hortensis*); mites on ash tree (*Tetranychus bimaculatus*); and mites on chrysanthemum flowers (*Tarsonemus pallidus*).

Fifth annual report of the state entomologist of Indiana, C. H. Baldwin (*Ann. Rpt. State Ent. Ind., 5 (1911–12), pp. 324, pls. 4, figs. 197*).—The first part of this report consists in large part of a general discussion of the more important insect pests occurring during the year, including remedial measures therefor. A popular account of the insects that affect the household and man is presented by H. F. Dietz (pp. 154–194), and a preliminary list of the plant lice or Aphididæ of Indiana, by H. Morrison (pp. 195–236). Accounts of some

important diseases of apple (pp. 239–270) and shade tree troubles (pp. 282–294) follow. The work concludes with a report of the division of apiary inspection, by D. W. Erbaugh and B. F. Kindig.

Observations and experiments on insect pests, W. H. Lawrence (*Washington Sta. Bul. 7, spec. ser., pp. 102–105*).—Kerosene emulsion applied as soon as the young made their appearance in the spring gave the best results in combating leafhoppers on blackberries in the open and nicofume fumigating paper gave good results in combating the pest on blackberry plants grown in the greenhouse for breeding purposes.

Experiments and observations made during 2 seasons are thought to justify the conclusions "that the cabbage maggot can be controlled by the use of various contact insecticides without injury to the older plants, at least provided the applications are thorough and timely in order that the eggs or the young worms are yet on the outside of the root. The shape of the root whether similar to that of the turnip or the cabbage, the date of planting versus the attacks of the pest, and the maturity of the plants modify conditions [and] in some cases determine the beneficial results following treatment."

Brief notes are given on the shot-hole borer and its injury to apples and prunes, and mention is made of a fungus which is associated with this borer.

Report on injurious insects in Finland, 1910, E. Reuter (*Landtbr. Styr. Meddel. [Finland], 1912, No. 84, pp. 17, figs. 3*).—This sixteenth annual report of the entomologist of Finland discusses the occurrence of the more important insect enemies of crops during the year 1910.

Insect enemies of cultivated plants in the German colonies, G. Aulmann (*Mitt. Zool. Mus. Berlin, 5 (1911), Nos. 2, pp. 259–273, figs. 14; 3, pp. 421–450, figs. 14*).—The first paper consists of a general account of the insect enemies of cotton, *Manihot glaziovii*, sesame, *Crotalaria grandibracteata*, mahogany (*Khaja senegalensis*), *Chlorophora excelsa*, and Bukoba coffee in German East Africa; the second paper deals with the insect enemies of cotton, coffee, and sorghum in the same colony. Among the more important pests considered are *Apion xanthostylum* which develops in the square and is an important enemy of cotton; *Xyleborus compactus* and *X. coffeæ* which bore in and cause the death of the branches of Bukoba coffee trees; *Idacantha magna* which injures coffee by feeding on the green berries and foliage; and *Busseola sorghicida* which is the source of injury to sorghum through boring in the stalks.

Insects liable to dissemination in shipments of sugar cane, T. E. Holloway (*U. S. Dept. Agr., Bur. Ent. Circ. 165, pp. 8*).—The foreign insects mentioned as liable to be disseminated in shipments of sugar cane are the larger moth borer (*Castnia licus*), weevil borers, froghoppers, leafhoppers, the pink mealy bug (*Pseudococcus sacchari*), the West Indian mole cricket (*Scapteriscus didactylus*), etc. The insects occurring in the United States enumerated are the sugar-cane moth borer, the gray mealy bug (*P. calceolariæ*), the sugar cane aphidid, etc.

Two enemies of tobacco (*Rhodesia Agr. Jour., 10 (1912), No. 2, pp. 179–190, pls. 3*).—This paper relates particularly to the cutworms *Agrotis segetis* and *A. ypsilon* and the splitworm or miner (*Phthorimæa operculella*).

Notes on the insect enemies of karite, A. and J. Vuillet (*Agr. Prat. Pays Chauds, 12 (1912), No. 117, pp. 436–448, figs. 9*).—The more important enemies of the shea tree (*Butyrospermum parkii*) here noted are the large bombycid *Cirina butyrospermi*, a pyralid (*Bostra* sp.), a cricket (*Pachytilus migratoroides*), *Mussidia nigrivenella*, and a leaf miner.

On the resistance of Cimex lectularius to various reagents, powders, liquids, and gases, B. Blacklock (*Ann. Trop. Med. and Par., 6 (1912), No. 4,*

pp. 415–428).—The author finds that insecticides in liquid and powder form are very limited in their utility in clearing houses of *C. lectularius*. Of the gaseous substances, sulphur dioxid is cheap and effective, killing when under pressure all stages in the cycle of development of the bug, including the egg, in 2 minutes.

Results obtained in the study of the froghopper during the wet season of 1910, L. H. GOUGH (*Dept. Agr. [Trinidad], Circ. 8, [1911], pp. 46, pls. 7, fig. 1*).—Previously noted from another source (E. S. R., 25, p. 852).

Host index to California plant lice, II (Aphididæ), E. O. ESSIG (*Pomona Col. Jour. Ent., 4 (1912), No. 4, pp. 826–828*).—This is supplementary to the index previously noted (E. S. R., 26, p. 149).

The aphids attacking cultivated peas and the allied species of Macrosiphum, F. V. THEOBALD (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 2, pp. 256, 257*).—The author finds that 3 species of aphids attack cultivated peas, namely, *Macrosiphum pisi*, *Megoura viciæ*, and *Aphis rumicis*. He states that the green pea louse (*M. pisi*) occurs only on plants of the genus Pisum, Lathyrus (both wild and cultivated everlasting peas), and all 3 varieties of clover (Trifolium). This aphid passes the winter in Europe and northern parts of America in the egg stage on clovers and to some extent on wild and cultivated Lathyrus. In May and June the winged females fly to peas (Pisum) and there live until late summer, when they fly back to clovers and wild Lathyri, and also to cultivated ones, where they later oviposit. *Megoura viciæ* also winters on *Lathyrus sylvestris*, and flies in spring to the peas and beans.

The Coccidæ of Europe, North Africa, and western Asia, including the Azores, Canary, and Madeira islands, L. LINDINGER (*Die Schildläusc (Coccidæ) Europas, Nordafrikas und Vorderasiens, einschliesslich der Azoren, der Kanaren und Madeiras. Stuttgart, 1912, pp. 388, figs. 36*).—The first part (pp. 1–45) of this work, which consists of a general account of scale insects, includes tables for their separation from members of closely related families and for the subfamilies of Coccidæ, with directions for their collection and study, etc. In the second or main part (pp. 47–346) descriptive tables are given under the various host plants and parts thereof by which the coccids recorded as infesting them may be identified. The third part (pp. 348–388) consists of a list of gall-forming coccids and their food plants, a list of the species not included in the second part, a locality index to the scales described, an index to the synonymy, an index to the valid species with the distribution thereof, etc.

Note on the biology of the genus Septobasidium, T. PETCH (*Ann. Bot. [London], 25 (1911), No. 99, p. 843; abs. in Agr. News [Barbados], 12 (1913), No. 279, p. 14*).—The author calls attention to the fact that fungi of this genus are parasitic on colonies of scale insects, which they overgrow and completely destroy. It is stated that one purple-black species which is fairly common on tea always grows over *Chionaspis biclavis*. Examinations made in the Kew herbarium are said to show that this habit is not confined to Ceylon species since a sterile specimen from North America, included under *Thelephora lichenicola*, also shows a colony of scale insects beneath the subiculum. It is pointed out that these fungi do not live on the secretions of the insects, as in the case of Meliola, but upon the insects themselves.

The gipsy moth as a forest insect, with suggestions as to its control, W. F. FISKE (*U. S. Dept. Agr., Bur. Ent. Circ. 164, pp. 20*).—This circular discusses the parasites of the gipsy moth, the wilt disease, and the natural resistance of certain species of trees to attack by the gipsy moth, as applied to the management of forests.

It is stated that even the forests have suffered less from gipsy moth injury than early predictions would have led one to expect, the situation having be-

come measurably improved within recent years. "The real amelioration so noticeable in the metropolitan district, and distinctly in evidence everywhere, is due to at least 4 main causes: (1) The perfection and standardization of the methods for artificial repression; (2) the death of a large proportion of the more susceptible trees or their removal from the infested woodlands; (3) the importation of parasitic and predatory insect enemies; and (4) the development of the wilt disease."

All of the promising species of gipsy moth parasites have now been imported and colonized under more or less satisfactory conditions in America; some additional work will be done toward assisting in the dispersion of certain species and possibly a new attempt will be made to import under more satisfactory conditions certain others which appear not to have established themselves as the result of earlier attempts. Otherwise the work of parasite importation may be considered as completed.

It is further stated that the amelioration in conditions is due to the wilt disease more than to parasites. The author emphasizes the fact that the resistance of certain species of trees to injury by the gipsy moth is directly due to the susceptibility of caterpillars, feeding upon the foliage of these trees, and to death through the wilt disease.

Aspergillus infecting Malacosoma at high temperatures, W. P. Gee and A. B. Massey (*Mycologia, 4 (1912), No. 5, pp. 279–281, fig. 1*).—In cultural experiments the fungus *Aspergillus flavescens* was found to develop on the apple tent caterpillar only when the caterpillars were kept at a temperature of 37° C., in which condition the growth was rapid and fatal. The infection apparently took place from the germination of spores taken into the digestive tract of the caterpillar along with its food. In experiments conducted at outdoor temperature none of the larvæ, either sprayed or unsprayed, showed any signs of such infection.

The pepper tree caterpillar (Bombycomorpha bifascia), W. Moore (*Agr. Jour. Union So. Africa, 4 (1912), No. 4, pp. 539–542, figs. 5*).—Pepper trees, which are commonly used as shade trees in the Transvaal, have for several years been regularly stripped of their leaves by this caterpillar. In this paper the author presents descriptions of the species with an account of its life history and means of control.

The apple and cherry ermine moths, P. J. Parrott and W. J. Schoene (*New York State Sta. Tech. Bul. 24, pp. 3–40, pls. 9, figs. 11*).—The authors first give an account of the general characters of the ermine moths with historical notes and synonymy, attacks upon fruit trees, host plants, common names, economic importance, and distribution. Then follows an account of the biology of the ermine moths and of their occurrence in New York, notes on identity of apple species, ermine moths on seedlings, and methods of control, and a synonymic bibliography of 9 pages.

"During recent years colonies of the caterpillars of the apple and cherry ermine moths have been discovered in considerable numbers in the State of New York. These insects were introduced in shipments of foreign nursery stock and appeared in plantations of imported apple and cherry seedlings. According to the records of the division of nursery inspection infested plants have been found at Lockport, Hilton, Chili, Dansville, Rochester, Penfield, Newark, Orleans, Seneca, and Geneva in western New York; at Johnston and Schoharie in the Mohawk Valley region; and at Blauvelt, in the Hudson River Valley.

"From the material that has been collected two species of moths were bred—*Yponomeuta malinellus*, which thrives largely on apple, and *Y. padellus*, which

is a more general feeder, showing preference for hawthorn, plum, and cherry. Both species are common and destructive fruit pests in Europe. . . .

"In the studies on the life history of these insects during the past 4 years the moths appeared during the first 2 weeks in July, and oviposition began about the middle of this month. The eggs are deposited in oval-shaped masses near a bud, usually of the current year's terminal growth, and less frequently on the older wood. Hatching takes place in early autumn and the young larvæ remain through the winter under the protecting crust of the egg shells. In the spring they assemble among the tender leaflets of an adjacent bud, which they attack. The older caterpillars feed openly on the foliage under the protection of a thin, grayish web. With the need of more food they extend their webs, seizing and involving fresh leaves in a common nest. In severe attacks trees may be defoliated and completely covered with the silken tents of the insects. Pupation took place during the latter part of June and early July and the moths lived from the beginning of July to about the middle of August.

"These insects have, in their normal habitat, a large number of natural enemies, the most important of which belong to the orders Hymenoptera and Diptera. In spite of the large numbers of the moths' eggs imported into the United States, the lepidopterons were apparently unaccompanied by their more common and efficient parasites. An ichneumon, *Mesochorus* sp., was obtained from *padellus* reared on cherry, and a tachinid, *Exorista arvicola*, was quite abundant in some colonies of *malinellus* caterpillars subsisting on apple.

"Comparisons of the structures of the caterpillars and of the male genitalia show no tangible structural differences between *padellus* and *malinellus*. The absence of differential features suggests that the moths from hawthorn and cherry and those from apple constitute a single species; but cross-breeding experiments are desirable to settle definitely the status of the 2 forms.

"An outbreak of these insects is to be expected from 2 sources: (1) From the annual importation of infested foreign-grown nursery stock, and (2) from spread of the pests that may have established themselves along the avenues of trade in previous shipments. The remedy is careful inspection of nurseries during June and the destruction of infested plants. As fruit pests, the insects would prove amenable to prevailing spraying practices."

Papers on deciduous fruit insects and insecticides.—Life history of the codling moth in the Santa Clara Valley of California, P. R. Jones and W. M. Davidson (*U. S. Dept. Agr., Bur. Ent. Bul. 115, pt. 3, pp. 113–181, figs. 13*).—The data here presented were collected in 1909 by D. Moulton and J. R. Horton, and in 1910 and 1911 by F. L. Young, the authors, and Miss Emma Weber. Seasonal-history studies, band records, and weather records are reported, and natural enemies of the codling moth, first brood emergence versus overwintering emergence, 1911, and control of the codling moth on pears and apples in the Santa Clara Valley are discussed.

One full generation and one partial generation of the codling moth larvæ occur in the Santa Clara Valley. A brief summary of its life cycle is given as follows: "The overwintered larvæ pupate from the middle of February until May, the moths issuing about 6 weeks later through a period extending from the latter part of March until the middle of June. Eggs are deposited about 3 days after emergence, and these hatch in about 12 days, the red ring appearing in 2 or 3 days and the black spot some 8 days later. The first-brood larvæ enter the fruit shortly after hatching and remain there for about 5 weeks. They are present in the fruit from the last week in April until the last week in July. . . . The first-brood pupal stage averages 21 days, only half as long as the corresponding stage of the spring brood, a fact due, undoubtedly, to the

considerably higher temperature influencing the former brood of pupæ. First-brood pupæ are present from about the middle of June until the middle of September, although the 2 years 1910 and 1911 show a considerable diversity on this point; for in 1910, the warmer of the 2 years, the first-brood pupæ were present 3 weeks earlier. Similarly the first-brood moths emerged just so much earlier in 1910. A fair proportion of the first-brood pupæ overwinter, and for this reason some individuals remain in the immature forms for 10 or 11 months. The first-brood moths begin to deposit eggs 3 days after issuing, and these eggs hatch in 11 days, or if the season is cold in 12 or 13 days. The red circle and black spot appear as in the first-brood eggs.

"The second-brood larvæ remain in the fruit about 50 days, and they are present from the latter half of July until the middle of October, a period of about 80 days, and thus shorter in comparison to the length of the larval stage than in the first-brood larvæ. This is accounted for by the shorter period of adult emergence, causing a shorter period of egg deposition in the first-brood moth as compared with that of the spring-brood moths. All larvæ of the second brood winter over and form the great bulk of overwintering larvæ. Doubtless if the fruit remained longer on the tree there would be a complete second brood possible, since so many varieties of apples and pears are picked before the end of September. In 1909 the second generation exceeded the first and this was a cold year, while in 1910 and 1911 the 2 generations were about equal in numbers, in spite of the fact that the former was a warm, the latter a cold year. In 1910 there was good reason to expect a large second generation, considerably greater in relation to the first generation than in 1911, but the relative proportions of the 2 generations was not maintained in 1910. Consequently it may be inferred that the weather does not always exert great influence on the relative sizes of the 2 generations any more than a large number of individuals of the first brood does on the second. . . . The larvæ of the second brood are present in all but the earliest varieties of fruit, and it is necessary to combat them. . . . The sex of the moth can be determined in the larval stage by the presence or absence of the 2 testes, which are black and in the male show through the skin on the dorsum of the eighth segment.

"Three applications of the poison spray are necessary for the control of the codling moth in this locality. The first should be made immediately after the petals have dropped from the blossoms, the second should follow from 2 to 4 weeks later, and the third a month or 6 weeks after the second."

The oak tortricid in Italy (Tortrix viridana), G. Cecconi (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 308–319, figs. 6*).—Studies of the morphology, biology, and natural enemies of *T. viridana* are here reported.

Contributions to the knowledge of insect pests, F. Silvestri (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 246–307, figs. 50*).—This third paper (E. S. R., 26, p. 147) treats of the 2 important lepidopterous enemies of the grape, *Polychrosis botrana* and *Cochylis ambiguella*.

On a mucedine parasite of the cochylis moth, G. Fron (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 2, pp. 151–154*).—In this second paper (E. S. R., 27, p. 56), the author states that the fungus which attacks the chrysalids of the cochylis and eudemis moths, previously described as *Spicaria verticillioides*, is a variety of *S. farinosa*.

The destructive Rhabdophaga of the willow in Italy (Rhabdophaga saliciperda), G. Cecconi (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 320–331, pl. 1, figs. 3*).—Studies of the morphology, biology, and natural enemies of this cecidomyiid, which attacks the trunks and branches of various species of Salix in Italy, are here reported.

Contributions to the knowledge of the parasites of the olive fly, F. SILVESTRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 176–203, figs. 33*).—This third paper (E. S. R., 25, p. 857) gives the results of studies of the morphology, biology, and natural enemies of *Oecophyllembius neglectus*, a lepidopteron which mines in the leaves of the olive. The insect enemies of this miner, studies of which are reported, are *Encyrtus mayri*, *Closterocerus formosus*, *Derostenus* sp., *Atoposoma variegatum*, *Sympiesis sericeicornis*, *Tetrastichus* sp., and *Eulophus longulus*, the last mentioned also parasitizing the olive fly (*Dacus oleæ*) and *Tischeria camplanella*.

Revised keys to the species of mosquitoes and mosquito larvæ found in New Jersey, H. B. WEISS and R. S. PATTERSON (*Ent. News, 24 (1913), No. 2, pp. 65–72*).—This revision of the tables, published in the report on mosquitoes, by J. B. Smith (E. S. R., 17, p. 56), is made necessary by descriptions of new species and various changes which have taken place in nomenclature and arrangement.

The sex of the larvæ of mosquitoes and other experimental work, HELEN A. ADIE (*Lancet [London], 1912, I, No. 13, p. 865*).—The author in working with the anopheline mosquitoes has succeeded in distinguishing the male from the female larvæ.

"On each side of the sixth abdominal segment of the anopheline larva can be made out, in males, a brownish oval tumidity. This can be seen with a two-thirds or a hand lens; with practice the latter is sufficient for a fair-sized larva. With a two-thirds it can be recognized on the third day. The brownish oval tumidity is the pear-shaped testis with its hard sac. On dissection it is found to be connected by a vas with a vesicula and ductus. It contains spermatozoa both formed and undeveloped. This test decides the question of the male sex. Twenty-four prognostications have come out correct on completion of metamorphosis. On dissection ovaries and spermatheca are quite clear in the female pupa, and in the case of the female larva rudimentary ovaries can be seen. In the Culex larva the testis has not the conspicuous brown color or the hard sac, and therefore is not so recognizable."

Note on the sex of mosquito larvæ, HELEN A. ADIE (*Ann. Trop. Med. Par., 6 (1912), No. 4, pp. 463–466, pl. 1*).—This is supplementary to the paper noted above.

Malaria control in California, H. F. GRAY (*Amer. Jour. Pub. Health, 2 (1912), No. 6, pp. 452–455*).—This paper deals with the work against anophelines.

The Simulium pellagra problem in Illinois, S. A. FORBES (*Science, n. ser., 37 (1913), No. 942, pp. 86–91*).—A paper read at the Second International Congress of Entomologists, at Oxford, England, on August 8, 1912.

House flies and how they spread disease, C. G. HEWITT (*Cambridge, England, 1912, pp. XII+122, pl. 1, figs. 19*).—A popular handbook.

Some experimental observations upon monkeys concerning the transmission of poliomyelitis through the agency of Stomoxys calcitrans, M. J. ROSENAU and C. T. BRUES (*Mo. Bul. Bd. Health Mass., n. ser., 7 (1912), No. 9, pp. 314–317; Psyche, 19 (1912), No. 6, pp. 191–194*).—This is the paper that was presented before the Fifteenth International Congress of Hygiene and Demography, Washington, D. C., September, 1912, abstracts of which have been previously noted (E. S. R., 28, pp. 160, 161).

New North American Tachinidæ, W. R. WALTON (*Ent. News, 24 (1913), No. 2, pp. 49–52, pl. 1*).—A tachinid parasite, reared from adult beetles of an undetermined species of Lachnosterna collected at Anasco, Porto Rico, in May, is described as *Eutrixoides jonesii* n. g. and n. sp.

The rhinoceros beetle (Oryctes rhinoceros) in Samoa, F. P. JEPSON (*Dept. Agr. Fiji Bul. 3, 1912, pp. 25, pls. 8*).—This paper is based on an investigation extending over a period of some 4 weeks.

The infected area now extends from Luatuanuu, about 10 miles east of Apia, in a westerly direction around the coast to Safata on the south coast of Upolu, a distance of from 60 to 70 miles. In this area there are 2 localities which are particularly badly affected, namely, at Apia and Saleimoa. In these districts 75 per cent of the palms show signs of attack, 30 per cent of these having their yield affected. Only from 1 to 20 per cent of the trees are killed, and of these some have been killed by the natives in their search for specimens. In the other infected districts 25 per cent of palms are attacked, 10 per cent suffer injury to the extent of having their yield affected, while none of the trees have been killed. It is stated that the beetle is increasing in spite of control measures, and that the affected areas are becoming more extensive. Traps employed as artificial breeding places prove the most satisfactory means of dealing with the pest at the present time.

Morphological studies of bark beetles, I, G. FUCHS (*Morphologische Studien über Borkenkäfer. I, Die Gattungen Ips De Geer und Pityogenes Bedel. Habilitationsschrift, Grossherzogl. Bad. Tech. Hochsch. Fridericiana Karlsruhe, 1911, pp. 45, figs. 39*).—This first paper deals with the genera Ips and Pityogenes.

Morphological studies of bark beetles, II, G. FUCHS (*Morphologische Studien über Borkenkäfer. II, Die Europäischen Hylesinen. Munich, 1912, pp. 53, pls. 3, figs. 89*).—This second part deals with the European Hylesinus.

The palm weevil as sugar cane pest, L. H. GOUGH (*Dept. Agr. [Trinidad] Circ. 9 [1911], pp. 6, pl. 1*).—Previously noted (E. S. R., 25, p. 855).

[Injury to the walnut leaves and shoots by the walnut curculio], A. L. QUAINTANCE (*Proc. Ent. Soc. Wash., 14 (1912), No. 4, pp. 211, 212*).—Reports of injury by *Conotrachelus juglandis* are said to have been received during 1912 from points in Pennsylvania, Maryland, and Connecticut.

The eggs are deposited in the shoots of various walnut trees from the first week in May until September. The larvæ infest the swollen base of the leaf stalk and also hollow out the tender shoots. In addition to *Juglans cinerea*, the pest was found to attack large numbers of exotic walnut trees, including *J. regia*, *J. siboldii*, *J. cordiformis*, and *Hicoria minima*, and to have practically wiped out an orchard of *J. regia*.

On a new species of Curculionidæ injurious to olives in South Africa, G. A. K. MARSHALL (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 3, 4*).—A weevil reared from South African olives, and which represents a new genus and species, is here described as *Anchonocranus oleæ*.

Philippine Rhynchophora, K. M. HELLER (*Philippine Jour. Sci., Sect. D, 7 (1912), No. 5, pp. 295–346*).—This paper dealing with the Pachyrrhynchidæ of the Philippines includes tables for the separation of the genera and species. Seventeen species and varieties of Pachyrrhynchus are recognized of which 12 species and 2 varieties are described as new to science. In addition 5 genera are characterized for the first time, namely Eupachyrrhynchus, Pseudapocyrtus, Macrocyrtus, Nothapocyrtus, and Metapocyrtus, represented by 1, 5, 3, 3, and 6 forms, respectively, new to science.

The behavior of the honeybee in pollen collecting, D. B. CASTEEL (*U. S. Dept. Agr. Bur. Ent. Bul. 121, pp. 36, figs. 9*).—This is a more detailed account of the subject than that previously noted (E. S. R., 28, p. 62), and deals with the structures concerned in the manipulation of pollen, the pollen supply, the pollen-collecting process, the action of the forelegs and mouthparts, the middle

legs, and the hind legs, pollen moistening, and storing pollen in the hive. A bibliography of 14 titles is appended.

The fungi of the beehive, ANNIE D. BETTS (*Jour. Econ. Biol., 7 (1912), No. 4, pp. 129–162, figs. 28*).—The author reviews previous work on the fungi of the beehive and gives description of 12 species of fungi, namely, *Pericystis alvei* and *Oospora favorum*, which are probably confined to the hive; *Gymnoascus setosus* and perhaps *Eremascus fertilis*, which are adapted to hive life, but not confined to this habitat; *Penicillium crustaceum*, *Aspergillus glaucus*, *Citromyces subtilis*, *C. glaber*, and *Mucor erectus*, common but not specially adapted to life in the hive; and *Aspergillus nidulans*, *Sordaria fimicola*, and *Gymnoascus ruber*, occasionally present. A bibliography of 30 titles is appended.

The humblebee, its life history and how to domesticate it, with descriptions of all the British species of Bombus and Psithyrus, F. W. L. SLADEN (*London, 1912, pp. XIII+283, pls. 7, figs. 34; rev. in Science, n. ser., 37 (1913), No. 944, pp. 180–182*).—This work, based upon observations extending over many years, takes up the subject under the heading of the life history of Bombus, Psithyrus the usurper bee, parasites and enemies of the humblebee, finding and taking nests, a humblebee house, domestication of the humblebee, how to distinguish the British species, making a collection, and anecdotes and notes. Seventeen species of Bombus, or true humblebees, and 6 species of Psithyrus, which comprise the parasitic humblebees, are described as occurring in the British Isles.

Among the data published for the first time are descriptions of the Sladen wooden cover for artificial nests and details of the author's humblebee house. It is stated that attempts made with queens to establish colonies artificially have been partially successful. The author's observations have shown that at least 2 of the species of Psithyrus here considered, namely, *P. rupestris* and *P. vestalis*, are deadly parasites of *Bombus lapidarius* and *B. terrestris*, respectively, in whose nests they live. The review is by W. M. Wheeler.

Geologic work of ants in tropical America, J. C. BRANNER (*Bul. Geol. Soc. Amer., 21 (1911), No. 3, pp. 449–496, pl. 1, figs. 11*).—The first part of this paper (pp. 453–476) deals with the true ants, their abundance, destructiveness, attacks on man, beneficial ants, ants as food, structures above ground, underground work, and relations to the soil. The white ants or termites are then dealt with in a similar manner (pp. 476–492).

Ants and termites are vastly more numerous in tropical America than they are in the temperate regions. They show a marked preference for a clay soil since their structures stand up better on clayey than on sandy soils. They affect the geology, especially the soil and subsoil, both directly and indirectly; directly by their habits of making underground excavations that radiate from a central nucleus and often aggregate several miles in length, by opening the soil to atmospheric air and gases, by bringing to the surface large quantities of soil and subsoil, by introducing into their subterranean excavations large quantities of organic matter which must yield acids that affect the soil and the subjacent rocks, and by using these excavations for habitations and the production of gases that attack the soil and its contained minerals; indirectly, by the periodic passage and circulation of meteoric waters through their extensive tunnels, by affecting the availability of the soil for agricultural purposes and the habitability of the land by man, by the destruction of crops, and by the consumption (by termites) of dead plants and of timbers and lumber used in houses and for the manufacture of furniture, machinery, etc.

[The work of ants and termites in China], W. N. LACY (*Science, n. ser., 37 (1913), No. 941, p. 57*).—It is stated that a house occasionally attacked by white ants was completely rid of them through placing black ants' nests under the

house, and that this was accomplished without being inconvenienced in any way by the black ants.

As regards the attack of termites on living trees, it is said to be not at all uncommon in China to find their mason work passage ways built up the trunks of growing trees. An instance is cited of an olive tree that had been riddled by the white ants.

The pear slug (Caliroa cerasi [Eriocampoides limacina]), R. L. WEBSTER (*Iowa Sta. Bul. 130, popular ed., pp. 3–8, figs. 4*).—This is a popular edition of the bulletin, previously noted (E. S. R., 27, p. 459).

Australian Hymenoptera Chalcidoidea, I–III, A. A. GIRAULT (*Mem. Queensland Mus., 1 (1912), pp. 66–189*).—These three papers deal respectively with the families Trichogrammatidæ (pp. 66–116), Mymaridæ (pp. 117–175), and Elasmidæ (pp. 176–189), presenting descriptions respectively of 10 genera and 39 species, 38 species and varieties, and 15 species, as new to science.

Basic slag successfully employed as an insecticide (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 3, p. 217; Agr. News [Barbados], 11 (1912), No. 278, p. 410*).—This article relates to the employment, by J. P. Wagner, of basic slag as an insecticide. About 1,400 lbs. per acre applied on fields infested with the sugar beet plant louse prevented the insects from attacking the leaves and also drove them from the leaves already attacked.

FOODS—HUMAN NUTRITION.

The bacteriology of fermentation and putrefaction in relation to the conservation of foods, S. C. PRESCOTT (*Amer. Jour. Pub. Health, 2 (1912), No. 11, pp. 834–839*).—Some of the most important of the organisms concerned in food decomposition are noted.

These organisms are very numerous and induce many changes in food, but they are all destroyed by short periods of heating at 120° C., and their development is inhibited by temperatures of 0° or lower, the inhibition lasting only as long as the low temperature is maintained.

Physics of refrigeration, P. H. BRYCE (*Amer. Jour. Pub. Health, 2 (1912), No. 11, pp. 829–833*).—The problems involved in obtaining efficient refrigeration of food products are enumerated as "securing the mature, healthy, and sound product as free as possible, whether on the surface or in the deep tissues, from microbes of fermentation and putrefaction; the surrounding of the fresh products with pure air which contains always the normal proportion of oxygen, and of a relative humidity at from 65 to 75 per cent; and the maintenance of the lowest degree of cold found necessary to preserve best any particular product."

The hygienic and economic results of refrigeration in the conservation of poultry and eggs, MARY E. PENNINGTON (*Amer. Jour. Pub. Health, 2 (1912), No. 11, pp. 840–848, figs. 2*).—The superiority of dry to wet packing for cold storage chickens is demonstrated, the methods being described in detail.

The loss of soluble proteins and nitrogenous extractives in the wet process is estimated at about 300 lbs. per carload, a loss in value of about $450. The wet packed chickens have a higher bacterial content at all stages of ripening, and their flavor is inferior to that of the dry packed chickens. Dry packing necessitates mechanical refrigeration. This form of refrigeration is of still greater value to the egg industry. See also a previous note (E. S. R., 24, p. 361).

Hygienic results of refrigeration in the conservation of fish and mollusks, H. D. PEASE (*Amer. Jour. Pub. Health, 2 (1912), No. 11, pp. 849–854*).—The author directs attention to the difference between refrigeration, that is, the application of degrees of refrigeration which will not freeze the fluids of the

tissues, and freezer storage, that is, the application of degrees of refrigeration sufficient to crystallize the fluids. The latter, though the more effective process, has been the more subject to adverse criticism.

Experiments in salt pickling, R. HOTTINGER (*Ann. Escola Polytech. São Paulo, 11 (1911), pp. 119–125*).—Experiments in pickling meats and other products indicate that salt does not prevent microbic contamination.

A culture medium nearly saturated with salt did not prevent the development of micro-organisms. They became accustomed to the culture medium the more easily and the more rapidly the less the concentration, and once accustomed to the medium they developed and propagated just as in a normal culture medium.

The formation of δ-lactic acid in incubated hens' eggs, K. ANNO (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 2–3, pp. 237–240*).—The experimental data reported show that when eggs were incubated for 3 days a considerable quantity of δ-lactic acid was formed in the egg white and only a very small amount in the egg yolk.

The preparation and effect of the substances in rice bran active in polyneuritis, H. SCHAUMANN (*Arch. Schiffs u. Tropen Hyg., 14 (1910), Beiheft 8, pp. 273–368; 15 (1911), No. 22, pp. 728–737; 16 (1912); 24, pp. 825–838; Beiheft 1, pp. 137–170; Nos. 11, pp. 349–361; Trans. Soc. Trop. Med. and Hyg., 5 (1911), No. 2, pp. 59–75*).—A substance was isolated from rice bran active in preventing or curing polyneuritis. The author considers this substance to be an activator.

In addition to this body, rice bran, according to the author, contains a poisonous substance, apparently cholin. The theory is advanced that the curative effects of the activator do not reside alone in the substance itself but rather that it assists in the building of compounds containing phosphorus, a view strengthened by the fact that the activator is found almost entirely in the pericarp of the rice grain, which is the principal phosphorus depot.

The results of an extended investigation are reported in these papers.

Some points concerning the treatment of wheaten flour, A. E. HUMPHRIES (*Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 365, 366*).—Some of the many chemical and physical problems encountered in the production of a uniform flour and a good quality of bread from a variety of wheats are stated.

Experiments on the digestibility of potatoes, M. HINDHEDE (*Skand. Arch. Physiol., 27 (1912), No. 4–6, pp. 277–294; 28 (1912), No. 1–3, p. 164; Ztschr. Phys. u. Diätet. Ther., 16 (1912), No. 11, p. 657*).—In experiments covering 5 weeks, made with a 26-year old man on a diet composed exclusively of potatoes, with butter, oleomargarine, or coconut fat, it was found that the potatoes were practically completely digested. The food, urine, and feces were analyzed.

Often nitrogen equilibrium was attained in 3 days with 5 gm. nitrogen in the food. In a supplement some data are given regarding an incomplete experiment with an American subject on a potato and butter diet, about 1,200 gm. of potatoes and an insufficient quantity of fat being eaten daily. Nitrogen equilibrium was not reached.

A study of canned vegetables, J. B. M. COEBERGH (*Pharm. Weekbl., 49 (1912), Nos. 20, pp. 429–431; 22, pp. 489–498, pls. 2; abs. in Chem. Zentbl., 1912, II, No. 4, p. 277*).—Canned spinach was examined for the presence of tin, the amount found in 70 cans ranging from 0.02 to 0.5 gm. per kilogram.

Biochemical and bacteriological studies on the banana, E. M. BAILEY (*Jour. Amer. Chem. Soc., 34 (1912), No. 12, pp. 1706–1730; Jour. Biol. Chem., 11 (1912), No. 2, Proc., pp. XLII, XLIII*).—From the bacteriological studies it appears, according to the author, that "the inner portions of the pulp of sound bananas are practically sterile, but that the regions of the inner coats

of the peel may be sparsely inhabited by bacteria, which, during normal ripening processes, are held in check but subsequently find conditions favorable to growth. The resistance of the protective covering of the fruit to invasion by bacteria points to the circulation of the plant juice as a more probable channel of infection, and suggests that infection occurs while the fruit is still on the tree.

"The limited experiments with the organism of decay hardly justify the conclusion that it is specific for banana tissue. It can be said, however, that the bacillus readily produces decay, and, to the extent of the trials . . . described, exhibits a marked tendency toward a specific character."

The studies on ripening were summarized as follows:

"Amylase is present in the early stages of ripening and persists even in the overripe fruit. Its action could not be satisfactorily demonstrated previous to the first heating which initiates the ripening process. Sucrase is present in the unripe stage but is much more intense in the ripened fruit. Alkalinity retards or inhibits its action. The hydrolysis of raffinose by banana tissue is conclusively demonstrated. The specificity of the enzym effecting this hydrolysis has yet to be established. The slight change undergone by maltose solutions under the influence of banana preparations does not warrant the unqualified assertion of the presence of maltase. No evidence of the presence of dextrinase or of lactase was obtained. A protease is present which appears to be of the erepsin type. Lipoclastic action was exhibited by both the unripe and ripe fruit. Peroxidase was found at all the stages of ripeness investigated."

From the studies of carbohydrate formations in the banana, it appeared that "the essential change during ripening is a conversion of starch into soluble carbohydrates which consist principally of cane and invert sugars and dextrins. Maltose is not present. An examination of the alcohol-soluble sugars by means of the osazone test failed to produce any maltosazone crystals. "Galactans were not found in the unripe or ripe pulp or in the peel of the ripe fruit."

A study of nuts with special reference to microscopic identification, W. J. YOUNG (*U. S. Dept. Agr., Bur. Chem. Bul. 160, pp. 37, pls. 5, figs. 10*).—The results are reported of a microscopic study of almonds, and their adulterants and substitutes (apricot, peach, and prune kernels), walnuts, hazelnuts, pine nuts, Brazil nuts, pistachio nuts, cashew nuts, and canarium nuts or Javanese almonds, the work being undertaken with special reference to the identification of nuts when pure or mixed with other nuts, and when in a comminuted condition. A key to species of nuts is provided, to facilitate the microscopic identification of those which are described.

Numerous illustrations supplement the text.

The possibility of tin poisoning from the use of coffee from tinned containers, H. STRUNK (*Veröffentl. Mil. Sanitätsw., 1912, No. 52, pp. 1–25; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 14–15, p. 639*).—Coffee infusion allowed to remain from 8 to 98 hours in a tin vessel contained no tin.

Beverages, past and present, E. R. EMERSON (*New York and London, 1908, vols. 1, pp. VI+563; 2, pp. IV+514*).—As noted in the subtitle, these volumes present a historical sketch of the production of beverages and a study of the customs connected with their use. The subject-matter is arranged geographically.

Report of the analyst, H. C. LYTHGOE (*Ann. Rept. Bd. Health Mass., 43 (1911), pp. 407–449*).—Included in this report are data regarding the examination of a large number of samples of milk and miscellaneous food products, paints, and oils.

[Examination of foods, condiments, etc.], B. L. PURCELL (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul. 20, 1911, pp. 84–125*).—A large number of analyses of miscellaneous food products, beverages, etc., are reported.

Report on bakeries and bakers in New York City, G. M. PRICE (*Prel. Rpt. Factory Invest. Com. N. Y. State, 1 (1912), pp. 201–268, pls. 11*).—A report is given of the sanitary inspection of 497 bakeries, with suggestions for remedying undesirable conditions where they existed. A bibliography is included as well as a summary of bakery legislation.

The problem of school lunches in Trieste, G. TIMEUS (*Il Problema della Refezione Scolastica a Trieste. Trieste, 1910, pp. 13*).—In this article, reprinted from Rapporto sanitario del Comune di Trieste, the value of school lunches is discussed from the standpoint of social engineering. The author believes that the supplying of these lunches is not charity but justice.

School lunches in Trieste, G. TIMEUS (*Sul Servizio della Refezione Scolastica nei Giardini d' Infanzia del Comune di Trieste. Trieste, 1910, pp. 16*).—An article reprinted from Rapporto sanitario del Comune di Trieste.

The new ration supplied at noon to the children attending the Children's Guardian Schools is designed to furnish to children from 3 to 6 years of age one-half of the nutritive material they require per day. The average ration contains 27.25 gm. protein, 13.20 gm. fat, and 101.69 gm. carbohydrates, and supplies 654.89 calories of energy. Detailed information is given regarding the quantity and kind of food supplied each day of the week in winter and in summer and the amounts of various foods required per hundred rations. The method of making the soup which constitutes a portion of the ration is described, as well as information regarding the source of supply of the foods and the examination of the milk.

Changes in prices and in household expenditures in Paris, D. DE BERNONVILLE (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, pp. 544–575, figs. 7*).—A study of the cost of living in Paris.

Practical cooking and serving, JANET MCK. HILL (*New York, 1912, pp. XVIII+679, pls. 79, figs. 6*).—In addition to a large collection of recipes, this volume contains discussions of marketing, the functions of food, providing a well-balanced menu or dietary, and similar questions

Fine cookery, WILHELMINE VON BESSER (*Die Musterküche. Stuttgart, 1912, pp. 425*).—Menus, with recipes for each day in the year, are given, with additional recipes.

A new book of cookery, FANNIE M. FARMER (*Boston, 1912, pp. XVII+440, pls. 8, figs. 226*).—An extended collection of recipes, with descriptive text.

The preparation of food, ALICE RAVENHILL (*Brit. Columbia Dept. Agr. Bul. 36, 1912, pp. 20, figs. 6*).—This bulletin, similar in scope to some of the Farmers' Bulletins of this Department, is designed for general distribution.

Labor-saving devices in the household, ALICE RAVENHILL (*Brit. Columbia Dept. Agr. Bul. 41, 1912, pp. 28, figs. 14*).—Simialr in scope to the above.

Increasing home efficiency, MARTHA B. and R. W. BRUÈRE (*New York, 1912, pp. 8+318+8*).—Among the chapters included in this discussion of home problems are the basis of efficiency, chance versus the budget, home administration, the home and the market, training the consumer, the cost of children, and savings and efficiency.

House sanitation, MARION TALBOT (*Boston, 1912, pp. VIII+116, figs. 7*).—This volume, which has been prepared as a manual for housekeepers, is designed to replace an earlier volume entitled Home Sanitation, by Ellen H. Richards and Miss Talbot.

The volume has been entirely rewritten and much new material added. The chapters deal with such topics as the new sanitation, the responsibility of the

housekeeper, situation of the house and care of the cellar, plumbing, air and ventilation, heating, light and lighting, furnishing, the country house, and household control of infection.

An index is provided and also a bibliography.

The diastatic power of human saliva, G. HIRATA (*Biochem. Ztschr., 47 (1912), No. 2, pp. 167–183*).—According to the experimental data reported, the diastatic power of saliva does not vary materially during the day and is not influenced by the time of eating or the kind of food. It is not dependent upon the quantity secreted, nor, with the exception of nursing infants, is it affected by the sex or age of the subject.

Contributions to the physiology of the stomach.—I, The character of the movements of the empty stomach in man, A. J. CARLSON (*Amer. Jour. Physiol., 31 (1912), No. 3, pp. 151–168, figs. 8*).—Movements of the empty stomach were studied in a subject with a fistula. The stomach pulse and factors affecting it are discussed at length.

As the author notes, the subject's stomach, when empty, "is never completely quiescent, at least during the first 24 hours after an ordinary evening meal or dinner. For even should the 20-seconds rhythm be shown to be a pylorus rhythm, this activity of the pylorus could probably not go on without considerable tonus of the fundus musculature. It is not improbable that this persistent motor activity of the empty stomach is present only in vigorous individuals."

Concerning the cause of intestinal movement, W. WEILAND (*Pflüger's Arch. Physiol., 147 (1912), No. 3–5, pp. 171–196, figs. 12*).—In the author's opinion, the experimental data reported show that the intestinal wall contains a substance which excites the Auerbach plexus, and it may be assumed that the anatomical movements of the intestine are of chemical origin.

The protein element in nutrition, D. MCCAY (*London, 1912, pp. XV+216, pls. 8*).—This volume, which is one of the International Medical Monographs, presents an exhaustive summary of the author's very extended investigations and the work of others bearing upon the importance of protein in the diet. The material is discussed with reference to low proteid theories, with which the author does not agree.

The following chapter headings show the scope of the work: The food of mankind, tropical food materials and their digestibility, the protein metabolism of mankind, the protein requirements of mankind, the merits and demerits of dietaries poor in protein, the effects of a low protein dietary in the Tropics, and the effects of the level of protein metabolism on the physique and general efficiency of different tropical tribes and races.

Some of the author's investigations with native races in India have already been noted (E. S. R., 25, p. 167), and the results of later work on the effects of Bengal food materials on pigeons are briefly summarized. The author concludes that none of the Bengal foodstuffs caused polyneuritis, neither the dals used in Bengal nor the Indian or country rice. "It is evident, therefore, that the absence of the beriberi vitamin in their dietary is not the explanation of the poor physique of the Bengalis."

With reference to his purpose and conclusions, the author states that in the present volume he has made use "of the observations and investigations of a great many of the more important recent publications on the subject, and has attempted to show that the weight of evidence is entirely against the great reduction of the protein content and caloric value of the dietaries of mankind so strongly advocated. . . .

"Recent investigations by different research workers have shown that it is possible to reduce very considerably the quantity of protein necessary to maintain an animal in nitrogenous equilibrium, when the particular nitrogenous

compounds required by that animal only are given in the food. In fact, at the present time, no one denies the feasibility of maintaining either man or animals in a condition of nitrogenous equilibrium on quantities of protein very much below the standards set up by the old masters in the science of nutrition.

"If we knew exactly how much, and what particular nitrogen compounds the body requires in each specific state of nutrition, it is rational to expect that it would be possible to maintain the body in health, vigor, and efficiency on quantities of protein very much less than those hitherto considered necessary; but, as we do not know what form of nitrogen combination nor how much of any particular unit is required in the different states of bodily nutrition, it is surely only rational that, in order to insure a sufficiency of those elements absolutely essential, a liberal standard of dietary should be recommended. . . .

"It seems, therefore, only reasonable to lay down such a standard of protein in the feeding of man as will at least give to the body the opportunity of obtaining the particular combinations it requires in any given state of nutrition.

"This deduction is fully borne out by a careful consideration of the information available from dietary studies carried out in many different countries, and particularly by the investigations made in India to determine the effects of different degrees of protein interchange on several tribes and races living under exactly the same conditions, except as regards diet. An absolutely dispassionate survey of the physical development and general capabilities of the races and people of India points undoubtedly to the conclusion that, other factors being eliminated, those who obtain a liberal supply of absorbable protein in their daily food are superior in every respect to those whose dietaries exhibit any marked degree of lowering of the average protein standard.

"The general conclusion arrived at, from a broad consideration of all the facts available in the present state of our knowledge, is that the views held by the older writers on nutrition are sounder and more in accord with the findings of careful scientific study than are those of the newer school."

Photographs of Indian natives used to low and abundant protein rations elucidate the text, and an index is provided.

On heat coagulation of proteins, HARRIETTE CHICK and C. J. MARTIN (*Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 281–286*).—The processes of heat coagulation of protein, consisting of denaturation, a reaction between protein and water, and agglutination, the subsequent aggregation of the altered protein complexes, are described. The reaction rate of denaturation, the relations of temperature and denaturation, the effect of acidity on denaturation, the progressive diminution of acidity during the denaturation of egg albumin, the effect of neutral salts upon the rate of denaturation, and the effects of various acids and salts and of temperature on agglutination are discussed.

Experiments with dogs fed gelatin, ammonium salts, products of meat which had undergone complete cleavage, and a mixture of all known amino acids, E. ABDERHALDEN and P. HIRSCH (*Hoppe-Seyler's Ztschr. Physiol. Chem., 81 (1912), No. 4, pp. 323–328*).—The experiments clearly showed that the erepton and ammonium acetate differed decidedly in their effects. The erepton induced gains in weight, while no gains were made but rather a considerable loss in weight was noted with ammonium acetate fed with gelatin.

The fate of prolin in the animal body, H. D. DAKIN (*Jour. Biol. Chem., 13 (1913), No. 4, pp. 513–516*).—Perfusion experiments with a surviving dog's liver did not lead to an increase in the normal formation of acetoacetic acid, nor was the acetoacetic acid excretion of glycosuric animals markedly increased by the administration of prolin. "It is clear, therefore, that prolin is not to be classed with phenylalanin, tyrosin, or leucin in having acetoacetic acid for a common catabolic path."

On the other hand, an administration of prolin to a glycosuric animal was found to result in a marked increase in sugar output, so that it would appear that prolin should be grouped with glutamic and aspartic acids, alanin, and glycin, which, with other bodies, are capable of furnishing glucose.

The chemic problem in nutrition, J. AULDE (*Philadelphia, 1912, pp. XV+410, pls. 2*).—As the subtitle, magnesium infiltration, indicates, the author has discussed in this volume data regarding magnesium metabolism and theories which he has deduced.

Contributions to the etiology of beriberi, W. P. CHAMBERLAIN, E. B. VEDDER, and R. R. WILLIAMS (*Philippine Jour. Sci., Sect. B, 6 (1911), Nos. 3, pp. 251–258; No. 5, pp. 395–404; 7 (1912), No. 1, pp. 39–52*).—The authors have previously shown that polyneuritis of chickens and beriberi result from deficiency of some substance, not phosphorus, in the diet, and that rice polishings contain a substance which prevents such disease. The experiments with fowls here reported indicate that the theory that beriberi is caused by acid fermentation of rice by saprophytic bacteria in the kernel is untenable.

The following substances were found useless in the prevention of beri-beri: Nitrogenous compounds such as arginin, histidin, asparagin, various amino acids, lecithin and cholin lipoids, and extract of onions. The neuritis-preventing substance which occurs in rice bran is insoluble in ether. It is absorbed by animal charcoal, after which maceration of the charcoal with water, absolute alcohol, or ether, does not remove the neuritis-preventing substance, nor is it present in the filtrate. Edema was not produced in fowls suffering from polyneuritis by ingestion of large amounts of sodium chlorid. They were protected by administering 5 cc. of an extract of rice polishings, but 2.5 cc., equivalent to 2.5 gm. of polishings, failed to protect them from polyneuritis.

Respiration experiments in man in the fasting condition and after the administration of various proteins, W. LOEFFLER (*Pflüger's Arch. Physiol., 147 (1912), No. 3–5, pp. 197–214*).—The spirometer results described agree completely with those obtained by other observers with respiration apparatus.

In the same person, the results remain constant for more than 4 years. On the administration of 50 gm. of caseinogen or of edestin, the gaseous metabolism increases by about 5 gm. of both oxygen and carbon dioxid.

Has the temperature of the food any influence on the gaseous metabolism of man? P. HÁRI and S. VON PESTHY (*Biochem. Ztschr., 44 (1912), No. 1–2, pp. 6–39; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 600, II, p. 952*).—A lowering of from 0.25 to 0.8° in the body temperature results from taking 1 liter of milk at 4° C., while a liter at 50° C. causes a rise in temperature of from 0.12 to 0.40°, lasting for some time.

Both the hot and cold milk cause an increased oxygen consumption of from 13 to 15 per cent, which ceases after 3 hours in the case of the hot milk, but lasts for several hours longer in the case of the cold milk, due, apparently to the longer time required to empty the stomach after cold milk ingestion. From the result of an experiment on one individual it was found that almost twice as much nitrogen is excreted in the urine after cold as after hot milk is taken.

The heat of respired air, LECERCLE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 23, pp. 1528, 1529; abs. in Chem. Zentbl., 1912, II, No. 10, p. 852*).—The construction, calibration, and method of using a thermopile for determining the amount of heat removed by respired air are described.

Effect of sterilization of the surroundings, the air breathed, and the food eaten, upon the digestion and the metabolism of animal organisms, KIANIZIN (*Jour. Physiol. et Path. Gén., 13 (1911), No. 5, pp. 689–694, fig. 1; abs. in Hyg. Rundschau, 22 (1912), No. 21, p. 1383*).—Experiments with rab-

bits, dogs, pigeons, rats, and guinea pigs indicate, in the author's opinion, that the presence of saprophytic bacteria in the air, food, and surroundings is indispensable to the life of the animal organism.

The death which comes quickly to the sterilized animals is not due merely to digestive troubles, but to changes in metabolism. They can not produce complete combustion of nitrogenous substances, and show a diminution of Robin's coefficient (uric nitrogen plus total nitrogen) and an abundant excretion of leucomains. It is believed that bacteria coming from without the organism bring with them oxidizing ferments which are taken up by the leucocytes when they absorb the bacteria, the ferments being utilized by the organism to obtain complete combustion.

The influence of carbohydrates on energy metabolism, P. HÁBI (*Biochem. Ztschr., 44 (1912), No. 1–2, pp. 66–83*).—The heat production and gaseous metabolism of dogs were measured by the Rubner respiration calorimeter and the Zuntz-Geppert apparatus.

From the increase of oxygen consumed and the heat production, the conclusion was drawn that after oral ingestion of sugar a large proportion is immediately metabolized and not stored as glycogen in the liver. The ingestion of dextrose sufficient to cover from 50 to 80 per cent of the energy needs of the organism of a fasting animal was accompanied by an increase in the heat production.

[A calorimeter for the measurement of] mental and muscular fatigue, J. S. MACDONALD and J. E. CHAPMAN (*Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 174, 175*).—The respiration calorimeter recently constructed at Sheffield University, England, is very briefly described.

So far it has been used only as a calorimeter. The authors claim to have found a method of measuring the heat output without measuring the rate of flow of the cooling water. For estimating the body surface of human subjects the formula $S=3H^3W$, has been adopted, in which S represents the body surface area, H the height, and W the weight of the subject.

ANIMAL PRODUCTION.

Annual reports of the American Breeders' Association (*Ann. Rpts. Amer. Breeders' Assoc., 7–8 (1911–1912), pp. 593, figs. 98*).—This publication contains the proceedings of the association, including the following papers which have reference to the breeding of animals: Breeding Experiments with Sheep, by T. R. Arkell (pp. 256–260), previously noted (E. S. R., 25, p. 573); Fecundity in Swine, by Q. I. Simpson (pp. 261–266), noted on page 574; Analytical Hybridizing, by Q. I. and J. P. Simpson (pp. 266–275), noted on page 574; The Blue Foxes of St. Paul and Otter Islands, Alaska, by J. Judge (pp. 275–279); A Study of the First, Second, and Third-Year Egg Production of White Leghorn Hens, by Clara Nixon (pp. 279–288), noted on page 577; The Behavior in Inheritance of the Unit-like Series, by H. H. Laughlin (pp. 304–312), noted below; An Algebra of Mendelism and its Application to a Mixed Hybrid Population, by A. W. Gilbert and G. B. Upton (pp. 312–320), noted below; The Teaching of Genetics, by C. I. Lewis (pp. 327–329); Genetics in the College Curriculum, by A. T. Wiancko (pp. 329, 330); Inheritance of Mammæ in Swine, by E. N. Wentworth (pp. 545–549), noted on page 574; Nutrition as a Factor in Fetal Development, by J. M. Evvard (pp. 549–560), noted on page 574; Further Report on Inheritance of Horn and Wool Covering in Sheep, by T. R. Arkell (pp. 561–568), previously noted (E. S. R., 28, p. 267); Dual Purpose and Total Fat Production, by E. N. Wentworth (pp. 568–571); and Segregation in Cattle, by E. N. Wentworth (pp. 572–580), noted on page 572.

The behavior in inheritance of the unit-like series, H. H. LAUGHLIN (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 304–312*).—A demonstration that in the analysis of biological pedigrees the neat fitting of facts is not a sufficient proof of location of a genetically independent unit.

An algebra of Mendelism and its application to a mixed hybrid population, A. W. GILBERT and G. B. UPTON (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 312–320*).—An illustration of a method of calculating the possibility of Mendelian inheritance by the laws of chance and the algebra of premutations and combinations. It is stated that this method possesses advantages over the geometric and other methods because of the simplicity of presentation, speed of calculation, and the flexibility and power of analysis.

The influence of suprarenal glands on growth, F. DE MIRA (*Compt. Rend. Soc. Biol. [Paris], 73 (1912), No. 29, pp. 377–379*).—A brief report of experiments with cats and dogs, which indicate that the secretions of the suprarenal glands stimulate growth in the animal body and particularly in the skeletal tissue.

Investigations on natural diets and the alimentary canal of mammals, A. MAGNAN (*Ann. Sci. Nat. Zool., 9. ser., 16 (1912), No. 1–4, pp. 206–247*).—This contains tabulated data on the weight of the stomach, weight, length and surface of the intestine, and the weight and length of the cecum in different classes of mammals.

New experiments on the function of the corpus luteum, L. FRAENKEL (*Arch. Gynäkol., 91 (1910), No. 3, pp. 705–761; abs. in Fortschr. Med. 29 (1911), No. 11, pp. 255, 256; Jahrb. Wiss. u. Prakt. Tierzucht, 7 (1912), pp. 196, 197*).—Experiments on a large number of animals lead the author to conclude that the corpus luteum causes changes in the uterus which attract and cause an attachment of the egg.

Critical studies on sexual trimorphism, E. WEISSER (*Kritische Studien über den Sexual Trimorphismus. Inaug. Diss., Univ. Bern, 1910, pp. 99*).—A discussion of primary and secondary sexual characters and a study of the effects of castration on man and domesticated animals. Measurements of castrated horses, cattle, and swine are presented in tabular form.

A bibliography is appended.

Sterility and impotence in male domestic animals, T. H. DALE (*Vet. Jour., 68 (1912), No. 450, pp. 674–686*).—This discusses the causes of sterility and the use of aphrodisiacs.

The feeding value of potato stalks and berries, W. VÖLTZ (*Ztschr. Spiritusindus., 35 (1912), Nos. 28, pp. 377, 378; 29, pp. 389, 390; 30, pp. 404, 405; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2027, 2028*).—In experiments with sheep both dried potato seed balls and ground potato stalks were found to be a satisfactory feed when given with hay.

The manufacture of sugar from wood, and its economic importance, A. ZIMMERMANN (*Jour. Roy. Soc. Arts, 61 (1912), No. 3133, pp. 69–81*).—A brief description is given of the Classen process of treating sawdust so that 25 per cent of sugar is formed from other carbohydrates, with a discussion of the value of the resulting product as a feeding stuff. Four lbs. of the product, known by the trade name of "sacchulose," was used to replace 4 lbs. of oats in the daily ration for horses. At the end of about 7 months the 4 horses had gained on an average 52.5 lbs. in weight.

Report of commercial feed stuffs, J. E. HALLIGAN (*Louisiana Stas. Feed Stuffs Rpt. 1911–12, pp. 122*).—This contains the annual report of feed inspection for the season 1911–12. Analyses are reported of cotton-seed meal, cotton-

seed feed, rice bran, rice polish, wheat bran, wheat shorts, corn chop, molasses feed, hominy feed, brewers' grains, beef scrap, tankage, alfalfa meal, corn screenings, and proprietary mixed feeds.

The increased cost of meat, MAIER (*Deut. Schlacht u. Viehhof Ztg., 12 (1912), Nos. 50, pp. 756–759; 51, pp. 771–774; 52, pp. 785–788*).—This contains statistics on meat production and the price of meat in Germany from 1905 to 1912.

Segregation in cattle, E. N. WENTWORTH (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 572–580, figs. 14*).—This contains data additional to those previously noted (E. S. R., 26, p. 667), with a discussion of results of Mendelian inheritance as regards horns and coat color.

The application of the theory of probability in investigations on the solid-color East Friesian cattle, E. HEUBÜLT (*Mitt. Landw. Inst. Breslau, 6 (1911), No. 3, pp. 425–448*).—Measurements of East Friesian cattle are presented in tabular form, and the results treated by biometrical methods. The origin of these cattle are also discussed.

Beef production, H. R. SMITH (*Nebraska Sta. Bul. 132, pp. 52, figs. 6*).—To test the value of corn silage for beef production in summer, 6 groups with 8 9-month-old grade steers in each group were fed for 20 weeks 3 days, beginning March 25. The gains and cost per head and day were as follows: On corn, alfalfa, and shredded corn stover there was a gain of 1.52 lbs., at a cost of 5.42 cts. per pound; on corn, alfalfa, and corn silage 1.85 lbs., at a cost of 4.66 cts.; on corn, wheat bran, and silage 1.4 lbs., at a cost of 6.17 cts.; on corn, linseed meal, and silage 1.51 lbs., at a cost of 5.91 cts.: on corn, cold-pressed cotton-seed cake, and silage 1.45 lbs., at a cost of 5.63 cts.; and on corn, cold-pressed cotton-seed cake, and silage 1.5 lbs., at a cost of 6.9 cts. per pound. The last lot received all the grain it would eat, whereas the other 5 lots were given about two-thirds as much.

On August 15, 1911, the supply of silage gave out and prairie hay was substituted for it in all groups mentioned above, with the following results during a period of 16 weeks: Corn, alfalfa, and corn stover 1.76 lbs., at a cost of 7.94 cts.; corn, alfalfa, and prairie hay 1.81 lbs., at a cost of 8.41 cts.; corn, wheat, bran, and prairie hay 1.55 lbs., at a cost of 10.07 cts.; corn, linseed meal, and prairie hay 1.74 lbs., at a cost of 9.43 cts.; corn, cold-pressed cotton-seed cake, and prairie hay 1.59 lbs., at a cost of 9.72 cts.; and corn, cold-pressed cotton-seed cake, and prairie hay 1.67 lbs., at a cost of 10.82 cts.

In a 100-day test in which corn silage was compared with corn stover with the same cattle when more mature, the following results were secured: On alfalfa, a light feed of corn, and a heavy feed of corn silage there was a gain of 1.49 lbs., at a cost of 10.69 cts.; on alfalfa, a medium feed of corn, and a medium feed of corn silage 1.72 lbs., at a cost of 10.35 cts.; on alfalfa, a heavy feed of corn, and a light feed of corn silage 2.11 lbs., at a cost of 9.27 cts.; and on alfalfa, a heavy feed of corn, and a light feed of corn stover 1.89 lbs., at a cost of 11.24 cts. per pound.

To secure data on the quantity of corn which can be most economically fed with silage and alfalfa to calves, a mixed lot of 32 calves weighing from 300 to 500 lbs., was divided into 4 groups. The average daily gains for 4 months on the different rations were as follows: On alfalfa and a heavy feed of corn silage (16.64 lbs. per day) 1.36 lbs., at a cost of 4.1 cts. per pound; on alfalfa, a heavy feed of silage (12 lbs.), and a light feed of corn (3 lbs.), 1.71 lbs. at a cost of 5.44 cts.; on alfalfa, a medium feed of silage (9 lbs.), and a medium feed of corn (6 lbs.) 1.91 lbs., at a cost of 5.7 cts.; and on alfalfa, a light feed of silage (6 lbs.), and a heavy feed of corn (9 lbs.) 2.26 lbs., at a cost of 6.14 cts. per pound.

A study of the separate records of the animals used in the above experiments showed that the variation in gains was fully as great within one breed as between representatives of different breeds.

"Type or conformation seems to be a controlling factor, the low-set, more compact types having something of an advantage in gains and much in early maturity over the range types. Gains seem to correlate to a considerable degree with body capacity as indicated by the size of the middle girth, the largest gainers having relatively larger middle girths at the same weight in most instances. While the average gains made by all dairy bred steers are nearly the same as those made by the beef bred steers up to the age of 23 months, the latter showed in most instances a higher condition of flesh, a larger proportion of high-priced meat, and sold for a higher price per hundred, returning larger profits to the feeder on the basis of the same initial cost per hundred."

Wintering pregnant ewes in Alabama, D. T. GRAY and L. W. SHOOK (*Alabama Col. Sta. Bul. 167, pp. 207–220, figs. 7*).—Pregnant ewes could not maintain their normal health and weight on a ration of sorghum hay, or on cotton seed and a small amount of cotton-seed meal, or on mixed hay consisting of soy beans, cowpeas, and crab grass. A daily ration of 0.54 lb. of cotton-seed meal and 1.87 lbs. of hulls produced satisfactory gains, but a ration of cotton-seed meal and corn silage also produced satisfactory gains at less cost.

A comparison of Cotswold and Southdown grade lambs.—Fattening rations for aged ewes, A. D. FAVILLE (*Wyoming Sta. Bul. 95, pp. 15, figs. 4*).—Twenty Cotswold grade lambs, the birth weights of which averaged 9.3 lbs., were put on a ration of alfalfa, roots, corn, and oil cake when they had reached about 80 lbs. in weight. The average daily gain was 0.46 lb. per head during a period of 49 days. A similar lot of Southdown grade lambs averaged 8.8 lbs. at birth, and gained 0.44 lb. per head and day during the feeding period. The dressed weight of the Cotswolds was 50.72 per cent and of the Southdowns 53.59 per cent. The average weight of the Cotswold fleeces was 5 lbs. 14.6 oz., length of staple 4.1 in., and shrinkage of fleece 43.3 per cent. The average weight of the Southdown fleece was 5 lbs. 2.4 oz., length of staple 2.75 in., and shrinkage of fleece 50.7 per cent.

The fattening ewes were fed different kinds of hay in connection with corn chop. Their gains per head and day for a period of 70 days were as follows: On alfalfa hay, 0.19 lb.; native hay, 0.14 lb.; and oat hay, 0.13 lb.

Value of Angora goats in land clearing, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., p. 120*).—On recent work in land clearing by means of Angora goats, continuing former work (E. S. R., 19, p. 570), the best results have been secured by slashing the field, constructing a goat-proof enclosure, and confining therein a sufficient number of animals to keep down the sprouts of the secondary growth.

Ration experiments with swine, A. D. FAVILLE (*Wyoming Sta. Bul. 96, pp. 19*).—Six shoats weighing about 43 lbs. each made an average daily gain of 0.66 lb. per head on a ration of corn and middlings. A similar lot on the same ration, but with access to pea pasture, made an average daily gain of 0.68 lb. per head, and another lot on rape pasture in addition to corn and middlings made an average daily gain of 0.49 lb. In a subsequent period, when all lots were put on grain alone, those which had been on pasture made faster gains than the first lot.

In a test lasting 69 days, 6 pigs weighing about 120 lbs. on a ration of corn made an average daily gain of 1.2 lbs. per head; a similar lot on corn and middlings a gain of 1.13 lbs.; and another lot on corn and alfalfa a gain of 0.71 lb. per head. The crossbreds made somewhat faster gains than pure-bred Duroc

Jerseys. Both rape and pea pasture were found to be valuable supplements to maintenance rations for brood sows and both effected a large saving of grain. Alfalfa hay was also found to be a good ration for the brood sow.

Pork production without milk or potatoes, A. GOUIN and P. ANDOUARD (*Jour. Agr. Prat., n. ser., 24 (1912), No. 40, pp. 428–430*).—In a 4 weeks' feeding test with 2 pigs averaging 110 lbs. on a ration of skim milk (first week only, through mistake), meat meal, peanut cake, copra cake, wild carob beans, and a small quantity of ground green bone the average daily gain was 1.51 lbs. each.

Garbage piggeries, A. W. BROWN (*Amer. Jour. Pub. Health, 2 (1912), No. 12, pp. 930–936, fig. 1*).—A description of a successful plant for a more economical method of disposing of city garbage than burning.

Analytical hybridizing, Q. I. and J. P. SIMPSON (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 266–275, figs. 8*).—This is a discussion of some unit characters in swine.

Fecundity in swine, Q. I. SIMPSON (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 261–266*).—A brief report on experiments in swine breeding. It is thought that fecundity can be increased by feeding the sow on highly nitrogenous food for some time before serving.

Inheritance of mammæ in swine, E. N. WENTWORTH (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 545–549*).—A statistical study of the inheritance of about 200 animals, although this number was not deemed large enough to obtain correlations of much significance. The following results are noted:

"The excess of males with reference to living pigs was 2.02 per cent. . . . In 30 per cent of the sows the number of teats giving milk and suckling pigs was equal. In 63.34 per cent the milking mammæ exceeded the number of pigs, and in 6.66 per cent the pigs exceeded the functional mammæ in number. In the latter class there was one more pig for one sow and an excess of two in the others; in the second class the total number of pigs was 71.51 per cent of the total number of functional mammæ. . . . The totals with the pigs show 130 pigs with symmetrical mammæ and 68 pigs with asymmetrical mammæ. When divided according to the odd or even number in the parent, the proportion still holds, 35:68 in the offspring of asymmetrical sows.

"It seems to the writer that there are at least two factors operating and that one of these is rather complex in make-up. The first, and complex perhaps, is the simple addition or subtraction of pairs of mammæ from parents to offspring, and secondly a restriction factor which prevents the development of one nipple of the normal pair."

Nutrition as a factor in fetal development, J. M. EVVARD (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 549–560*).—This contains data additional to those previously noted (E. S. R., 27, p. 279). The vitality of the pigs seemed to be to a great extent dependent upon the rations fed to the mother, as shown from the following table, the lots being arranged in decreasing order of relative vigor:

Vigor of offspring of brood sows in percentages of total births.

Ration.	Strong.	Medium.	Weak.	Dead.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Ear corn and meat meal 4:30	93.18	4.55	2.27	None.
Ear corn and alfalfa in racks	89.47	7.89	None.	2.63
Ear corn and meat meal 1:30	91.89	5.41	2.70	None.
Ear corn and clover in racks	93.75	None.	6.25	None.
Ear corn, oats, bran, middlings, oil meal	83.02	5.66	5.66	5.66
Shelled corn, chopped clover, molasses	85.71	None.	11.43	2.86
Ear corn alone	68.42	15.79	15.79	None.

The 4 lots producing the largest and strongest pigs at birth were likewise the cheapest producers, the cost per pound ranging in these lots from 7 to 19 cts., as compared with 29 cts. when corn was fed alone. The pigs from the lots receiving meat meal had longer, denser, and brighter cherry-red coats than did the pigs from the other lots. "The pigs from the sows receiving nothing but corn did not show nearly so heavy and glossy colored coats as the other lots and this was attributed to the following observed factors: (1) The skin underlying the coat was lighter—approaching a colorless skin—and of a somewhat anemic condition. This would tend to make the coat appear less highly colored than if the skin were pink and rosy as in lot 3. (2) There was really less coat because of a smaller number of hairs per unit area, and further because the hairs were comparatively short. The apparent differences in coat color were really due to differences in quantity of hair and color of background than to a fundamental difference in color of the hairs themselves."

The practical significance of these results and those obtained by other investigators in feeding brood sows are discussed.

Notes on horse colors, C. E. WOODRUFF (*Jour. U. S. Cavalry Assoc., 23 (1913), No. 94, pp. 699, 700*).—Evidence is presented in addition to that previously noted (E. S. R., 26, p. 75) concerning the superiority of white-haired horses for withstanding extremes of heat and cold, and their inferiority where there are no extremes of temperature.

The histology of the oviduct of the domestic hen, F. M. SURFACE (*Maine Sta. Bul. 206, pp. 395–430, pls. 5*).—This is a detailed account of a study of the microscopic anatomy of the structure of the oviduct of the domestic fowl, which was made in order to understand the physiology of the albumin, membrane, and shell formation in the making of an egg.

The results are summarized as follows: "Two muscular layers, an outer longitudinal and an inner circular layer can be distinguished in all parts of the oviduct. The inner surface of the oviduct is thrown into a number of primary longitudinal ridges. The epithelium over these ridges forms secondary folds. In the uterus the ridges as such are lost and instead there are a number of leaf-like folds of the inner surface.

"Three types of glands are described: (1) Unicellular epithelial glands occurring between the ciliated cells in all parts of the oviduct except the anterior portion of the funnel. (2) Glandular grooves. These are accumulations of gland cells at the bottom of the grooves between the secondary folds of the epithelium. These are found only in the funnel region. But there they occur well toward the anterior end. The presence of glandular structures in the funnel region has not hitherto been recognized. (3) In all parts of the oviduct between the funnel and the vagina there is a thick layer of glands beneath the epithelium. I have called these tubular glands. They consist of long convoluted and branched tubules which open to the lumen of the oviduct by short epithelial ducts. These tubular glands are homologous, structurally at least, with the glandular grooves of the funnel. The tubular glands reach their greatest development in the albumin secreting region. Histologically the unicellular epithelial glands present a similar appearance in all parts of the oviduct except the vagina. In this latter region the cells are longer and much narrower and have a slightly different arrangement than in other parts of the oviduct.

"The walls of the tubular glands consist of large gland cells which in the albumin portion and the isthmus of a laying hen have small, irregularly shaped, dark staining nuclei which lie well toward the basal ends of the cells. In these two regions the protoplasm of the cells consist of rather coarse granules which vary greatly in size.

"The line of demarcation between the albumin region and the isthmus is characterized by the absence of these tubular glands in that region. The cells of the tubular glands in the albumin region and in the isthmus present the same histological appearance.

"In the uterus the cells which form the tubular glands have a somewhat different appearance. The nuclei of these cells are large with regular outlines and are situated near the center of the cells. The protoplasm is very finely granular and is quite different from the coarsely granular condition found in other parts of the oviduct.

"The tubular glands or any homologous structures are entirely absent from the vagina. Only the unicellular epithelial glands occur here."

In the last section of the paper some suggestions are offered as to the probable function of the various glandular structures in the different parts of the oviduct. A bibliography is appended.

The mode of inheritance of fecundity in the domestic fowl, R. PEARL (*Maine Sta. Bul. 205, pp. 283–394, figs. 3; Jour. Expt. Zool., 13 (1912), No. 2, pp. 153–268, figs. 3*).—A detailed account of the results of an investigation into the inheritance of fecundity of the domestic fowl, which has now involved 13 generations and several thousand individuals. The basic data as derived from trapnest records of (a) pure Barred Plymouth Rocks, (b) Cornish Indian Games, (c) the F_1 individuals obtained by reciprocal crosses of these 2 breeds, and (d) the F_2 individuals obtained by mating the F_1 inter se and back upon the parent forms in all possible combinations.

The work as a whole shows that the record of the fecundity of a hen taken alone is not a reliable indication of the probable egg production of her daughters, and that mass selection on a basis of fecundity records of females alone fails to produce any change in type in the direction of selection. But fecundity is inherited in some fashion, and the ways in which it might be inherited are discussed in detail.

The number of visible oöcytes in the ovary were counted and were found to bear no constant relation to the actually realized egg production, which means that the observed differences in egg production depend on differences in the complex physiological mechanism concerned with the maturation of the oöcytes and ovulation.

Winter egg production was found to fall into 3 well-defined classes, (a) birds with high winter records, (b) those with low winter records, and (c) those which did not lay at all in the winter period. The division between (a) and (b) for Plymouth Rock stock falls at a production of about 30 eggs.

The results are accounted for by the Mendelian hypothesis as follows: There were found to be 3 distinct and separately inherited factors upon which fecundity in the female fowl depended. The first of these, which may be called the anatomical, determines the presence of an ovary. The other two are separate physiological factors. "The first of these (denoted by L_1) is the basic physiological factor, which when present alone in a zygote with F brings about a low degree of fecundity (winter record under 30 eggs). This factor is under no limitations in gametogenesis but may be carried in any gamete, regardless of what other factors may be also present. The second physiological factor (denoted by L_2) when present in a zygote together with F and L_1 leads to a high degree of fecundity (winter record over 30 eggs). When L_1 is absent, however, and L_2 is present the zygote exhibits the same general degree of fecundity (under 30) which it would if L were present alone. These two independent factors L_1 and L_2 must be present together to cause high fecundity, either of them alone, whether present in one or two 'doses,' causing the same degree of low fecundity.

"The second physiological factor L_2 behaves as a sex-limited (sex-correlated or sex-linked) character, in gametogenesis, according to the following rule: The factor L_2 is never borne in any gamete which also carries F. That is to say, all females which bear L_2 are heterozygous with reference to it. Any female may be either homozygous or heterozygous with respect to L^1. Any male may be either homozygous or heterozygous with reference to either L_1, L_2, or both."

This interpretation throws light on the earliest selection experiments at the station, and shows why the immediate constitution of the male plays so important a part in determining the fecundity of the daughters. It is pointed out that for the improvement of the race by breeding attention must be given to the gametic condition, rather than to the somatic characters, of the parent stock. Though it is stated that somatic conditions may play a part in any well considered system of breeding for a particular hen, blind mass selection on the basis of somatic characters only is essentially a haphazard system of breeding, which may or may not be successful in changing the type.

A bibliography of 53 titles is appended.

The inheritance of fecundity, R. PEARL (*Pop. Sci. Mo., 81 (1912), No. 4, pp. 364–373*).—In this paper, which was read at the First International Eugenics Congress, the author discusses the anatomical basis of fecundity and the mechanism of inheritance of fecundity as measured by winter egg production of fowls, based on work noted above. Some possible applications from these results to the science of eugenics are pointed out.

A study of the first, second, and third-year egg production of White Leghorn hens, CLARA NIXON (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 279–288*).—A statistical study of egg production in White Leghorn hens, with the following results:

Modes and constants of variation in egg production.

Period of egg production.	Modal class.	Mean.	Standard deviation.	Coefficient of variability.
Total egg production per hen (3 years)	175–200 200–225 325–350	271.307±6.1366	85.349±4.3395	31.458±1.7268
Egg production per hen for first year of laying	100–125	92.614±2.6925	36.571±1.8594	39.487±2.3077
Egg production per hen for second year of laying	50–75	95.455±2.7839	38.720±1.9687	40.564±2.3770
Egg production per hen for third year of laying	75–100	87.784±2.4463	34.023±1.7360	38.758±2.2477

The coefficients of correlation were as follows: Total production per hen for 3 years and first year production, 0.7501±0.0314; total production for 3 years and second year production, 0.8491±0.0201; total production for 3 years and third year production, 0.6240±0.0439; first year and second year production 0.5484±0.0503; first year and third production, 0.1530±0.0702; second year and third year production, 0.3973±0.0606.

The practical conclusion drawn from these figures is that the first year egg record was a fairly safe basis as a selection of second year layers. Neither the first year nor the second year record could serve as a satisfactory basis for the selection of the third year flock, although it is stated that with hens kept under different conditions, with different methods of feeding, or with other breeds, different results might be obtained.

Investigations on the causes of the formation of silky and woolly feathers in fowl, F. TAUBERT (*Untersuchungen über die Ursachen der Seiden- und Wollfederbildung bei Hühnern als Beitrag zur pathologischen Entstehung von Rasse-*

Merkmalen. Inaug. Diss., Univ. Bern, 1910, pp. 80, pls. 3).—A study of feather development, from which it is concluded that the silky and woolly feathers are pathological conditions due to environment, and are examples of the inheritance of acquired characters which give origin to racial characteristics.

A bibliography is appended.

Statistical contributions to poultry breeding (*Wiener Landw. Ztg., 62 (1912), No. 95, pp. 1095, 1096*).—This contains statistics on the poultry industry of the world.

Experimental pheasant breeding, Rose H. Thomas (*Proc. Zool. Soc. London, 1912, III, pp. 539–546, pls. 4*).—A continuation of earlier work (E. S. R., 25, p. 870). From results obtained with crosses of *Phasianus formosus* and *P. versicolor* the following conclusions are drawn:

"The male parent transmitted to his F_1, female offspring much of the female plumage of his species and the dimension of the egg. The female parent transmitted to her F_1 male offspring much of the male plumage of her species. In the F^2 generation, the offspring of F^1 female × Versicolor male, the Versicolor male seems to have transmitted every character—bill, leg color, plumage, habit, and temperament—of the female of his species to his F^2 female offspring, while he has not transmitted every character of the male of his species to his F_2 male offspring; repeating exactly the results of the original experiment with *gennæus*."

DAIRY FARMING—DAIRYING.

The influence of breed and individuality on the composition and properties of milk, C. H. Eckles and R. H. Shaw (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 156, pp. 27*).—These studies were made in connection with those previously noted (E. S. R., 28, p. 470), using the same animals, the same rations, and the same methods of sampling.

The average percentage of total solids in the milk of 3 Jerseys was 14.09, 13.34, and 15.02, respectively; in 2 Ayrshires, 12.08 and 12.71; in 3 Holsteins, 12.12, 10.73, and 11.35; and in 3 Shorthorns, 13.08, 13.01, and 12.17. The average percentage of fat was as follows: In 3 Jerseys, 4.87, 4.64, and 5.36; 2 Ayrshires, 3.51 and 3.85; 3 Holsteins, 3.23, 2.93, and 3.1; and 3 Shorthorns, 3.89, 4.13, and 3.37. The average percentage of casein in 3 Jerseys was 2.93, 2.65, and 3.13; 2 Ayrshires, 2.62 and 2.81; 3 Holsteins, 2.49, 2.11, and 2.49; and 3 Shorthorns, 2.74, 2.87, and 2.62. The average percentage of total protein in 3 Jerseys was 3.7, 3.27, and 3.97; in 2 Ayrshires, 3.11 and 3.33; 3 Holsteins, 3, 2.7, and 3.21; and 3 Shorthorns, 3.4, 3.49, and 3.28. The relation of fat to casein showed but little variation within the breed, but the Jersey milk contained relatively more fat than the other breeds.

The average percentage of sugar for each cow was as follows: Three Jerseys, 4.85, 4.95, and 4.8; 2 Ayrshires, 4.85 and 4.96; 3 Holsteins, 5.05, 4.26, and 4.25; and 3 Shorthorns, 5.04, 4.91, and 4.98. The other constants are given in the following table:

Average chemical and physical constants of the milk fat by breeds.

Breed.	Relative size of fat globules.	Iodin number.	Saponification number.	Reichert-Meissl number.	Melting point.
					°C.
Jersey	328	30.52	228.9	26.73	32.95
Ayrshire	150	31.61	228.2	25.96	33.45
Holstein	142	34.20	229.1	25.46	32.88
Shorthorn	282	34.36	227.6	26.28	33.23

Breed was apparently a factor in the size of the fat globules, the Reichert-Meissl number, and the iodin number. There was little difference due to breed or individuality in the saponification number, and the melting point of fat showed no variation that could be attributed to breed and but little to the individual animals. With the exception of the size of the fat globules, the fat constants are considered to be far less influenced by breed and individuality than the stage of the lactation period. The feed, also, is considered a greater factor than breed or individuality in influencing the nature of the fat.

Variations in the composition and properties of milk from the individual cow, C. H. ECKLES and R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 157, pp. 27*).—This contains data obtained in connection with the work noted above, showing the variations of individual cows.

One of the most striking results obtained was the slight variation from day to day in the percentage of protein. More than 90 per cent of the analyses made showed a variation of less than 0.2 per cent from the average of the animal supplying the samples, and no sample showed a variation of more than 0.3 per cent from the average. The percentage of sugar varied only a little more than that of the total protein. In the case of the fat the extreme variation reached almost 2 per cent. Only 56 per cent of the samples came within 0.3 per cent of the average, showing that the sample taken from a single milking is of little value as an indication of the percentage of fat in the milk of any one cow.

In determinations of the Reichert-Meissl number 58 per cent varied less than 1 from the average, showing that fluctuation was quite marked. The iodin number varied even more, and there was also considerable variation in the saponification number; 62.2 per cent varied less than 2 from the average. There seemed to be no relation between the iodin number and the amount of fat or any other constituent. An increase in the iodin number in most cases was accompanied by a decline in the Reichert-Meissl number and in the saponification value. The melting point did not vary to any great extent; 96.5 per cent of all samples varied less than 1 degree from the average.

In comparing morning and evening milk, the chief differences were in the Reichert-Meissl number, which was higher in the morning, and the iodin number, which was higher in the evening milk. The fat content was slightly higher in the morning milk. Samples from 2 animals which were milked 3 and 4 times daily showed wider variations than those from the cows milked twice only, although no appreciable variation was found in the total protein, sugar, and ash. The only striking difference between the first and last drawn milk was in the percentage of fat and the size of the fat globules, both being larger in the last drawn. The Reichert-Meissl number, iodin number, and saponification number were generally lower in the strippings than in the first milk. The detailed analyses of the milk used from the 7 cows in this investigation are presented in tabular form.

Experimental studies on milk, E. H. SCHORER (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 295–337*).—A study of the different grades of milk and the effect of storage upon certified, inspected, and pasteurized milk, based on daily observations of samples covering a period of 10 months.

Tests are reported for acidity, fermentation, and sediment, also bacterial counts at the time the samples were taken and after storage for a varying length of time. Some of the results are as follows:

"Our better classes of milk contain little sediment, market milks containing more dirt but fewer cells than certified milks. The Tromsdorff tube is a convenient method for examining for dirt and cells. . . . Cream on rising carries with it a large portion of the bacteria in milk. Separator cream does

not take with it as large a portion of the bacteria as does gravity cream. . . . Of the bacteria in good milks about 30 per cent were acid producers, while 20 per cent of those in inspected and 30 per cent of those in certified and pasteurized milks were protein digesters. At the higher temperatures fermenting organisms increased more rapidly in certified milk, but at the lower temperatures the most marked increase was observed in pasteurized milk. The percentage of peptonizing types increased only at low temperatures. Apparently gravity cream contains the larger portion of peptonizing forms, while the skimmed milk below contains most of the fermenting forms when milk has been refrigerated.

"In a lactose medium 41.43 per cent of certified, 55 per cent of inspected, and 84 per cent of pasteurized milks produced gas. Certified milk did not contain bacteria producing hydrogen sulphid and indol as frequently as did inspected and pasteurized market milks. Milk from definitely diseased quarters is less acid than from healthy quarters. . . . Coagulation occurred as soon after delivery in pasteurized market milk as in raw milk. . . . When clotting had occurred the curd was most acid. The straw-colored fluid under the cream is an evidence of peptonization and was not as acid in reaction as the curd and whey. Gravity cream, above the skimmed milk, was as acid as the skimmed milk as long as the acidity of the mixed milk was not high. . . . Protein decomposition without coagulation occurred principally at a temperature near the freezing point. Adding an equal part of 68 per cent alcohol to milk is an easy and reliable test for the detection of beginning acidification. The tests for catalases and reductases are of much value. The catalase and slow reductase tests are of assistance in detecting old milk, and the hastened reductase test offers a convenient and reliable method for detecting and testing the efficiency of pasteurization. Gravity cream carries with it a large portion of the ferments of milk.

"The fear of putrefying organisms in pasteurized milk is not warranted as far as market milk pasteurized by the holding method is concerned. While predominance of putrefying bacteria is not the only objection to pasteurized milk, it has been an important one. Certified milk, because it contains but little cow manure, is infected principally with spore-bearing organisms; it is always well refrigerated, and contains as large a percentage of protein-digesting and no more acid-forming bacteria than does pasteurized milk."

A study of streptococci from milk and from epidemic sore throat, and the effect of milk on streptococci, E. C. ROSENOW (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 338–346*).—These streptococci were isolated from milk, from cream purchased in the open market, and from separator slime obtained from a milk clarifier. The results are summarized as follows:

"Streptococci, virulent for animals, but which differ from typical *Streptococcus pyogenes* in a more abundant growth, in being encapsulated and not forming chains, and in causing but little hemolysis, occur in predominating numbers in epidemic sore throat of milk-borne origin. On artificial cultivation these strains sooner or later assume the characteristics of *S. pyogenes*.

"Cultures on blood agar plates from ordinary milk usually give rise to colonies of streptococci that do not cause any hemolysis, but the injection of rabbits and other animals with milk 'slime' practically always produces infection with encapsulated, but otherwise typical, hemolytic streptococci. The blood agar plate method consequently is not a reliable means with which to search for *S. pyogenes* in milk. By placing *S. pyogenes* in unheated milk it becomes modified so as to correspond to the streptococci in epidemic sore throat. The modifications may be accentuated by passage through guinea pigs, and in some cases cultures like those of *S. mucosus* may result.

"The fact that milk so modifies streptococci is an additional indication of the important part it may play in epidemic sore throat. It is not possible to determine whether the streptococci in such epidemics are of exclusively bovine or human origin; they may be of both. Milk drawn in a sterile way from normal cows may contain virulent streptococci and pneumococci; hence, 'certified milk,' while surely less contaminated than ordinary milk, may contain pathogenic bacteria, and the advisability of pasteurization even in this case should be considered, especially during seasons when sore throat is common.

"Butter and cream may contain virulent streptococci."

Micrococcus mucofaciens, a new species causing a milk defect, J. THÖNI and A. C. THAYSEN (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 3 (1912), No. 6, pp. 335–341; Centbl. Bakt. [etc.], 2, Abt., 36 (1913), No. 15–18, pp. 359–365*).—The name *M. mucofaciens* is given for a previously undescribed species of bacteria which produces a slimy fermentation in milk. Although somewhat variable in form it is distinctly a micrococcus type, varying in size from 0.5 to 2.4 microns in diameter. The optimum temperature for its development is about 33° C., with a range from 22 to 42°. Other properties when grown in pure cultures, which are quite different from most other species causing a slimy fermentation, are given in detail.

The effect of stabling upon the composition of goat's milk, F. G. KOHN (*Deut. Tierärztl. Wchnschr., 21 (1913), No. 4, pp. 49–55*).—The fat content, total solids, and physical contents of goat's milk, when the animals are kept under different conditions, are reported. It is concluded that the quality of the milk is much better when the goats are kept in pasture than when confined in a stable.

[Dairying in Alabama], L. W. SUMMERS and L. W. SHOOK (*Alabama Col. Sta. Circ. 18, pp. 97–128, figs. 11*).—This contains practical information on feeding and managing dairy cattle, feed and care of the calf, the bull, and silos and silage.

The actual cost of producing silage on 9 Alabama farms is presented in tabular form, the average figures being as follows: Acres of corn grown 10.25, yield per acre 6.71 tons, cost per acre $8.73, cost per ton of filling the silo 87 cts., and total cost of silage per ton $2.33.

The manufacture of Cheddar cheese from pasteurized milk, J. L. SAMMIS and A. T. BRUHN (*Wisconsin Sta. Research Bul. 27, pp. 137–248, figs. 17*).—This is a report of experiments made in devising a new method of making Cheddar cheese from pasteurized milk. The advantage of pasteurizing the milk for cheese making, difficulties to be met with, and previous unsuccessful attempts are briefly outlined.

The results of testing the effect of adding calcium chlorid and hydrochloric acid to restore coagulability to the curd are presented in tabular form. Whenever the acidity of the milk used was low (0.16 to 0.18 per cent), the moisture content of the cheese made with calcium chlorid was high (40 to 44.45 per cent), and when the acidity was high (0.21 to 0.23 per cent), the moisture content was low (38 to 40 per cent); but in all cases where hydrochloric acid was added to the same milk instead of calcium chlorid, the moisture content of the curd was from 37.5 to 40 per cent whether the natural acidity of the milk was high or low. The hydrochloric acid curds always began to thicken from 6½ to 7 minutes after rennet was added, while with calcium chlorid, the first visible coagulation occurred earlier if the milk used was very ripe, and later if the milk was sweet, thus varying from day to day. The percentage of fat lost in the whey was on the average about 0.14 per cent greater with calcium chlorid than with hydrochloric acid. The scores and criticisms show that the cheese

made with calcium chlorid were neither as uniform, nor so good in quality, as those made with hydrochloric acid.

Cheese from milk pasteurized at 160° C. were cleaner in flavor and scored higher than the check; and in every case higher than the cheese pasteurized at 140 or 150°. Temperatures higher than 160° resulted in cheese inferior in flavor and texture.

The pasteurized milk curds retained moisture more tenaciously than raw milk curds, and this effect was more marked at the higher temperatures. The yield of cheese obtained by pasteurizing at 160° was slightly larger than that obtained from raw milk. Pasteurizing decreased the power of the curds to coalesce or mat when on the rack or in the press. Several types of pasteurizers were used, but there were no appreciable differences which could be traced to the use of different machines.

Although other acids were used, most of the cheese made from pasteurized milk were made with hydrochloric acid, and the use of this acid is described and recommended in the present bulletin. Cheese made with 0.75 per cent, 1 per cent, or 1.25 per cent starter were about equally good as regards flavor and texture.

Among other conclusions drawn were the following: "The green pasteurized milk cheese shrank a little more than the raw milk cheese, so that when paraffined, the average gain in yield from pasteurized milk was 4.76 per cent. After curing at 60 to 70° F. for about 100 days, the gain in yield of pasteurized milk cheese over raw was 4.22 per cent. The average loss of fat in whey from pasteurized milk is about 0.17 per cent, measured at the time the whey is drawn from the vat. This is less than half the loss in average factories using raw milk. The total loss of fat in whey and drippings from vat and press, using pasteurized milk, averaged 1.58 per cent of the weight of the cheese, or less than half that of the usual loss in handling raw milk.

"In addition to this saving of fat, it is found that a somewhat larger proportion of moisture is incorporated in pasteurized milk cheese than in ordinary cheese, without damage to the quality. The gain in yield of pasteurized milk cheese is therefore due partly to fat and partly to moisture. Scores and criticisms given by competent cheese judges show that the pasteurized milk cheese varied less in quality, and averaged better by 3.7 points of total score, than the raw milk cheese made from portions of the same milk supply. The pasteurized milk cheese scored higher than the raw milk cheese in 96 per cent of all cases.

"Duplicate sets of cheese were cured at New Orleans for 1 month at 70 to 83° (monthly average figures during the summer), and here the raw milk lost more in weight than the pasteurized, so that the average gain in yield of pasteurized over raw rose to 6.21 per cent. From other cheese cured at Madison in a warm room, it was learned that the raw milk cheese lose considerable amounts of fat at 75 to 85°, while the pasteurized milk cheese lost none.

"Storage for a month at 75 to 80°, average temperature, as at New Orleans, is not recommended for any cheese, yet it was found that the pasteurized milk cheese averaged 3 to 8 points better in total score, after such storage, than the raw milk cheese. Since pasteurized milk cheese can be cured without injury at 70°, it is likely that in many cases the expense of cold storage for these cheese can be avoided. Pasteurized milk cheese can be put into cold storage at 34° at the age of 1 week, and possibly earlier without injury. . . .

"Preliminary estimates show that the maximum extra cost may be 45 cts. for 2,000 lbs. of milk, with many chances for reducing the cost in handling larger quantities. Because of the increased yield of cheese, the saving in rennet, and in cold storage charges, there is a saving of about $2.23 in handling 2,000

lbs. of milk. . . . Allowing $1 for cold storage charges on 200 lbs. of cheese, there is yet a profit of about three-eighths of a cent a pound through pasteurization."

Directions are given for pasteurizing, acidulating, use of starter, and all details for each operation involved in making the cheese by the new method, although cheese makers are advised to await the publication of results of further trials before undertaking to use it on a commercial scale.

Studies on the rational manufacture of Parmesan (Grana) cheese, C. GORINI (*Centbl. Bakt. [etc.], 2. Abt., 36 (1912), No. 1–5, pp. 42–53; Milchw. Zentbl., 41 (1912), No. 21, pp. 641–650; abs. in Chem. Zentbl., 1913, I, No. 1, p. 47*).—This is a third report (E. S. R., 20, p. 574), which deals with the causes of defects in Parmesan cheese. The author insists on the importance of more sanitary methods in the production and handling of milk and the use of pure cultures for ripening, as most of the defects are caused by the development of undesirable organisms. Reference is also made to the green color of cheese which sometimes occurs because the milk is held too long in copper receptacles.

Factors influencing the Swiss cheese production, E. KONRADI (*Mælkeritid., 25 (1912), Nos. 41, pp. 929–943; 43, pp. 993–995*).—Observations on the manufacture of Swiss cheese, with special reference to the possible development of the industry in Denmark, are presented.

VETERINARY MEDICINE.

Handbook of veterinary surgery and obstetrics, edited by J. BAYER and E. FRÖHNER (*Handbuch der Tierärztlichen Chirurgie und Geburtshilfe. Vienna and Leipsic, vol. 7, 1913, pt. 2, pp. XI+696, figs. 210*).—In this second part of volume 7 of the work previously noted (E. S. R., 27, p. 881) M. G. de Bruin deals with obstetrics as related to the smaller domestic animals (pp. 1–125), and M. Albrecht with equine obstetrics (pp. 131–675).

Studies of the historical development of animal breeding and veterinary medicine and their correlation, E. A. HAAS (*Studien über die Historische Entwicklung von Tierzucht und Tierheilkunde und ihre Correlation. Inaug. Diss., Univ. Bern, 1912, pp. 68*).—This inaugural dissertation includes a bibliography of 84 titles.

Annual report on the distribution of animal diseases in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reiche, 26 (1911), pp. VI+115+210, pls. 4*).—In this report the extent and distribution of the important animal diseases occurring in the German Empire are considered. The details concerning the distribution of the diseases are given in tabular form, and maps showing the occurrence of rabies, glanders, foot-and-mouth disease, and sheep scab during the year 1911 are appended.

The results of meat inspection in the German Empire in 1909 (*Ergeb. Schlachtvieh u. Fleischbeschau Deut. Reiche, 1909, pp. IV+50+138, fig. 1*).—This report presents the results of the meat inspection work in Germany, largely in tabular form.

Forensic-chemical detection of savin oil poisoning, J. HÄMÄLÄINEN (*Biochem. Ztschr., 48 (1912), No. 3–4, pp. 241–246*).—The author prepared well characterized salts of sabinol-glycuronic acids. Among these the strychnin salt is adapted to detecting poisoning by sabinol. A dose of from 1 to 1½ cc. of sabinol (equal to from 3 to 4 cc. sabinaol) when given to an animal is sufficient to show the presence of sabinol-glycuronic acid as a strychnin salt in the urine.

In regard to examining the efficiency of the Strassburger method for detecting anthrax, A. ENGLER (*Experimentelle Untersuchungen Hinsichtlich*

der für die Bewirkung der Sporulation des Milzbrandbazillus Geeignetsten Substrate Vermittelst des "Strassburger Verfahrens" zum Nachweis von Milzbrand. Inaug. Diss., Univ. Bern, 1911, pp. 67).—Previously noted from another source (E. S. R., 26, p. 678).

The production in vitro in the normal brain of structure simulating certain forms of Negri bodies, EDNA STEINHARDT, D. W. POOR and R. A. LAMBERT (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 459–463, pl. 1*).—When the cells of normal guinea pig brains were incubated in blood plasma, small pink-staining bodies (stained by Van Gieson's method) surrounded by a blue granular ring were observed in the cytoplasm. The bodies were indistinguishable from the unstructured Negri bodies frequently found in the rabid guinea pig brain. In a few cases the forms contained a central blue staining point or ring and closely resembled some of the smaller structured forms of the Negri bodies.

Normal guinea pig brains treated with street or fixed virus, incubated in the same manner, showed the same structures. "The brains of guinea pigs dying of street virus, and rabbits dying of fixed virus, incubated in small fragments, gave no development of the Negri bodies in blood plasma, beyond the small structured and unstructured forms, although in one preparation the ganglion cells appeared to be living at the end of 21 days' incubation."

A contribution to the knowledge of the trypanosomes occurring in healthy cattle, P. P. VAN DER POEL (*Beiträge zur Kenntnis der bei Gesunden Rindern Vorkommenden Trypanosomen. Inaug. Diss., Univ. Bern, 1912, pp. 75*).—This dissertation consists in large part of a detailed review of the literature relating to the subject. The paper closes with a brief discussion of personal investigations, and a bibliography of 27 titles is appended.

During the course of examinations of the blood of 75 cattle at the National Serum Institute at Rotterdam in November and December, 1911, and January and February, 1912, trypanosomes were found by the author in the blood of 14, or about 21 per cent, of the 66 grown cattle. Morphologically the parasites resemble *Trypanosoma transvaliense*, a variety of *T. theileri*.

Studies on the biochemistry and chemotherapy of tuberculosis.—I, The permeability of tubercles for iodin compounds and proteins, H. G. WELLS and O. F. HEDENBURG (*Jour. Infect. Diseases, 11 (1912), No. 3, pp. 349–372*).—"It is shown that compounds of iodin injected into tuberculous animals enter glandular tubercles with readiness, so that the proportion of iodin in such tubercles is usually greater than it is in most other tissues except the kidney; furthermore, it is greater in the caseous contents than in the cellular peripheries of the tubercles. Tuberculous eyes usually contain much more iodin than their normal mates. This property is shown not to depend on any specific character of the tubercle itself, for other necrotic tissues also take up more iodin than normal tissues. The explanation offered is that normal cells are not perfectly permeable to iodids (except perhaps kidney cells) and lose this impermeability or semipermeability when killed or injured, thus becoming entirely permeable for crystalloids present in the surrounding fluids. As the iodin content of the blood increases and decreases with absorption and elimination, so the iodin in the necrotic area, whether tuberculous or otherwise, varies, indicating an absence of any chemical or physical binding of the iodin in such areas. A simple, inert, colloid agar, implanted in the tissues, behaves in quite the same way.

"Egg albumin injected into tuberculous pigs is found, by means of the anaphylaxis reaction, to penetrate the avascular tubercles but little if at all, even when present in the blood in large amounts. This agrees with the hypothesis that the passage of iodin from the blood into the tubercles is a

purely physical matter, the crystalloidal iodin compounds diffusing through the inert colloidal solution of a necrotic area practically unimpeded, while the colloidal egg albumin, according to the law of colloidal diffusion, is practically unable to diffuse through such a colloidal solution.

"No evidence could be found of any tendency for iodin compounds of whatever nature to accumulate in tubercles or other necrotic areas, or to persist in such areas when disappearing from the normal tissues and the blood.

"Exudates contain approximately the same proportion of iodin as the blood of the same animals, and hence any area with inflammatory edema and congestion will commonly show more iodin than normal tissues, although not usually more than the blood. No evidence was found of any specific entrance or fixation of iodin in inflammatory exudates. The iodin is distributed about alike in the fluid and solid portions of the exudate, indicating simple diffusion. Of normal tissues only the kidney seems to contain approximately as much iodin as the blood of the same animal. This may have some bearing upon its excretory function, since it indicates a greater permeability of renal cells than of other gland cells for iodids."

The hydrolysis of the tubercle bacillus, N. O. Sieber (*Centbl. Bakt. [etc.], 1. Abt., Orig., 66 (1912), No. 7, pp. 554–556*).—By subjecting 1 gm. of tubercle bacilli to the action of from 300 to 350 cc. of 1.5 per cent hydrogen peroxid for ¼ to 2 hours in an autoclave at 143° C. and a pressure of 3 atmospheres, a perfectly clear and colorless solution is obtained.

Tuberculo-infection of man through animals and animal products, A. O. Zwick (*Amer. Vet. Rev., 41 (1912), No. 5, pp. 545–566*).—A presentation of the various facts which stand out favoring the theory that bovine tuberculosis is transmissible to man.

Immunity and therapy of tuberculosis, A. Bruschettini (*Centbl. Bakt. [etc.], 1. Abt., Orig., 66 (1912), No. 7, pp. 531–537*).—The serovaccine prepared by the author was found to act directly upon the various factors concerned in the tubercular process, the causative specific organism, and the diseased tissue. The result, although slow to obtain, is certain and lasting.

Can tuberculous antibodies be produced in sound animals? K. Bundschuh (*Ztschr. Hyg. u. Infektionskrank., 73 (1913), No. 3, pp. 427–442*).—It is possible to produce tuberculous antibodies in sound and tubercular animals. Even though the titer obtained was not very high, it was higher than that obtained by other authors with tubercular animals.

Tuberculosis in cattle and how to combat it (*De Tuberculose onder het Rundvee en Hare Bestrijding. The Hague, 1911, pp. 35*).—This is a statement in regard to the nature of tuberculosis, its dissemination, and how to combat it. The measures taken by the Dutch government to prevent the spread of this disease, and a resolution adopted December 1, 1910, giving the rules and regulations for combating tuberculosis in cattle, are stated.

The query sheet employed by the government agents is shown.

Infectious abortion in cattle, W. Giltner (*Amer. Vet. Rev., 42 (1912), No. 2, pp. 145–156*).—After reviewing the literature and discussing the status of our present knowledge of this subject, the author reports his results with abortin prepared in the bacteriological laboratory of the Michigan Experiment Station.

Attention is drawn to the fact that alarming symptoms follow the use of abortin when injected intravenously, whereas by giving the substance subcutaneously no untoward results are noted. The findings with various animals were grouped under 5 headings: (1) No reaction, no abortion; (2) reaction, no abortion; (3) abortion, no reaction; (4) abortion, reaction; (5) not pregnant, no reaction.

The author was unable to check up the results by one or both of the serum tests. As was to be expected, none of the first group of animals was clinically affected and consequently did not react. The possible reason that the second group of animals did not abort is because abortin is believed to confer a certain degree of immunity. As for the third group of animals, "3 of these animals failed to react, although they had aborted and had reacted to a previous test made at a time nearer to the act of abortion. Possibly their failure to react to a second test is attributable to the effects of the previous injection of the reagent. This is the case in tuberculin testing many times."

The abortin test as a reliable diagnostic agent in infectious abortion has narrow limitations. "In favor of the abortin test is the possibility of its easy application by the practicing veterinarian, who has no laboratory facilities or who has no special training in serum diagnosis." A well-known and well-advertised remedy against contagious abortion was found to consist of 98 per cent of water, and the remainder of phenols (carbolic acid), oil of cloves, and some material resembling vegetable matter.

Acting on the theory that this disease in cows is a local uterine infection, attempts were made to immunize a virgin heifer with living cultures of the abortion bacillus in the belief that immunity will be phagocytic as in many other local infections. This heifer with another untreated heifer was bred 12 days after the last inoculation. "After about 4½ months of pregnancy both heifers were injected intravenously with 10 cc. each of a typical culture of *Bacterium abortus* incubated 5 days. Only a slight temperature reaction followed in each case. No other effects of the inoculation were observed. Three months and 8 days later, or at nearly the eighth month of pregnancy, each heifer was again inoculated with 10 cc. of a similar culture intravenously and each received 30 cc. of the same culture in the vagina. No temperature reaction occurred. Each animal experienced a normal parturition." Probably the culture used was lacking in pathogenic properties.

"In concluding [the] discussion of immunity production, the following may be a practicable plan: Inject all nonpregnant females subcutaneously with the living culture once, twice, or more times, using 30 cc. more or less of culture. . . . All pregnant cows should be tested with abortin not so much for its diagnostic value as for its hypothetical therapeutic function."

Infectious vaginitis and endometritis in cattle, E. HESS (*Arch. Wiss. u. Prakt. Tierheilk., 38 (1912), Nos. 4, pp. 373–408; 5–6, pp. 457–513*).—This paper reports studies carried on with or in continuation of those previously noted (E. S. R., 17, p. 1015). It takes up the etiology, diagnosis, course, spread, pathological anatomy, treatment, etc. A list of the literature referred to is appended.

Outbreak of rabies among station flock, O. L. PRIEN (*Wyoming Sta. Rpt. 1912, pp. 69–71*).—A brief report of the occurrence of rabies in 5 of 6 sheep of the station flock that had been bitten by dogs, together with the symptoms and pathology.

Sarcosporidiosis of sheep, O. L. PRIEN (*Wyoming Sta. Rpt. 1912, pp. 67–69, figs. 2*).—*Sarcocystis tenella* was observed in the myocardium of about 2 of every 3 of the 60 odd sheep upon which post-mortems were held during the summer in connection with the work with poisonous range plants.

Wireworms in sheep and their treatment, A. THEILER (*Agr. Jour. Union So. Africa, 4 (1912), No. 4, pp. 572–586, figs. 3*).—In preliminary experiments here reported it was found that lambs could be dosed 10 times at weekly intervals with the maximal safe dose of Cooper's dip and bluestone without bad results. The dosing of pregnant ewes with the maximal safe dose was followed in 2 instances by the death of the twin offspring. The free access of

sheep to a lick, containing Cooper's dip and bluestone, for a period of 3 months, during which time one sheep consumed on an average daily 2.3 grains of Cooper's dip and 2.3 grains of bluestone, had no decisive effect on the worms.

Studies on the virus of hog cholera, W. E. KING and R. H. WILSON (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 16 (1913), No. 3, pp. 367–376*).—"The present paper is based partly upon results [previously noted (E. S. R., 24, p. 186)] and partly upon experiments which have been conducted since that publication."

From this work it appears that when hog cholera virus remains in the blood of the horse for from 30 to 60 minutes, an activation of the virus seems to take place. In a series of 48 hogs 85.2 per cent died as a result of increasing injections of this horse serum virus. In 2 other series of tests made for the sake of comparison 11 and 10 hogs were treated with the virus, the series with 11 hogs receiving horse serum virus prepared by adding the hog cholera virus and horse serum in vitro. In these 2 series 54.4 and 60 per cent, respectively, of the animals died. The same quantitative relations were observed in all of the 3 series and in every instance the same virus was used. The average period of incubation was 6.3, 10.3, and 12.8 days, and the average period of sickness 14.9, 17.4, and 19.1 days respectively.

When sound hogs were given the horse serum virus, the incubation time was found to be shorter in hogs which were treated with equal amounts and the same dilution of virus and horse blood in vitro, physiological salt solution and hog cholera virus, or undiluted hog cholera virus. The minimum fatal dose of virulent serum as prepared by dilution with physiological salt solution did not seem to be equivalent to the minimum fatal dose of the virus diluted with horse serum, i. e., horse serum virus. Hog cholera serum when given to horses intravenously produced more toxic symptoms than when a normal hog serum was given in the same manner.

Hog cholera in Manitoba, C. D. MCGILVRAY (*Amer. Vet. Rev., 42 (1912), No. 3, pp. 301–307*).—This paper was presented at the annual meeting of the American Veterinary Medical Association, held at Indianapolis in August.

Outbreaks of hog cholera were reported from the vicinity of Winnipeg during 1886 and near Carman in 1899, since which time it did not reappear until August, 1911, when it was found to occur among pigs in the district immediately surrounding the city of Winnipeg. Almost simultaneously, other outbreaks were reported in the vicinity of other urban centers of western Canada. Investigations show the infection to have been introduced in kitchen garbage from hotels and restaurants.

The efficiency of anticholera serum as a curative and preventative agent, R. A. CRAIG (*Amer. Vet. Rev., 42 (1912), No. 2, pp. 200–205*).—This paper points out particularly the causes for failure in antihog cholera vaccination. The procedure as followed at the Indiana Experiment Station is stated.

A report of over three years' experience with the Schafer phylacogens in the treatment of infections in horses, F. M. SAWYER (*Amer. Vet. Rev., 42 (1912), No. 3, pp. 273–283*).—As a result of treating various diseases with phylacogens, the author concludes that they are a reliable remedy for use in routine veterinary practice. Of the 546 cases treated, including distemper, influenza, surgical infections, laminitis, azoturia, navicular disease, etc., there was not a single death.

The mallein tests, C. J. MARSHALL (*Amer. Vet. Rev., 42 (1912), No. 2, pp. 192–199*).—The results obtained seem to justify the conclusion that few glandered horses will escape detection by the thermic test. When this test shows positive, it should be verified by the ophthalmo test because all horses reacting

to the latter test can be safely destroyed. As a further precaution all reactors should be held 2 weeks longer, then samples of blood from them taken for the serum test and again tested with the thermic mallein test. Those reacting a second time with this test or giving an eye test should be considered glanders without further consideration.

When acute glanders or other febrile disease is present, mallein should not be used subcutaneously. At first the results obtained with the agglutination test were found to be variable but later became more reliable.

The technique of the ocular mallein test as carried out in Pennsylvania is given in detail.

RURAL ENGINEERING.

Report of the state engineer and surveyor, State of New York, 1910, F. M. WILLIAMS ET AL. (*Ann. Rpt. State Engin. and Surveyor N. Y., 1910, pp. 770, pls. 36*).—This report includes data on the operations of the year, tests of materials, surveys, the work of the land bureau, and stream gagings, together with a large amount of statistical, hydrographic, and other data.

Annual report of the state engineer and surveyor, State of New York, J. A. BENSEL ET AL. (*Ann. Rpt. State Engin. and Surveyor N. Y., 1911, pp. 257, pls. 55, figs. 2; sup., pp. 314*).—This report is in 2 parts, part 1 dealing with the state engineering administration and operations, including state barge canals and land surveys, tests of materials, and a large amount of tabulated statistical and other data. Part 2 is a report of the bureau of hydraulics of the state barge canal department, by J. P. Newton, and contains a large amount of hydrographic and stream flow data from the gaging of the streams of the State.

Irrigation and seepage experiment (*Rpt. Cawnpore [India] Agr. Sta., 1912, pp. 31–39*).—This report includes the tabulated results of experiments extending over 6 years, showing the amounts of water necessary for the ordinary irrigated crops of the province and the seepage losses in field water channels at different times of the year.

A comparative statement, showing the duty of water for the different crops during the 6-year period, indicates for maize, from 2 to 9 waterings of from 60,000 to 70,000 gal. per acre per watering; for cotton, 1 to 3 waterings of about 70,000 gal. each; for potatoes, 4 to 8 waterings of from 40,000 to 60,000 gal. each; for wheat, 2 to 3 waterings of from 40,000 to 70,000 gal. each; for cane, from 12 to 24 waterings of 50,000 to 60,000 gal. each; for vegetables, 12 waterings of about 50,000 gal. each; and for peanuts 2 to 4 waterings of from 50,000 to 70,000 gal. each.

The figures for seepage and evaporation losses on a 150 yard channel were found to vary considerably in different years and at different periods of the year, reaching a maximum in the case of a dry channel used for the first time during the hot weather, and the minimum in channels used for several consecutive days in cold weather. The magnitude of the loss indicates that badly aligned and poorly maintained small channels are more responsible for loss than the actual overwatering of crops.

Elements of hydraulics, M. MERRIMAN (*New York and London, 1912, 1. ed., VI+156, figs. 86*).—This book presents the principles and methods of hydraulics without the use of higher mathematics, and deals in a comprehensive manner with those topics which are of greatest importance in practical hydraulic engineering work. It contains chapters on hydrostatics, theoretic hydraulics, flow from orifices and tubes, flow through pipes, flow in conduits and rivers, measurement of water, hydraulic motors, and pumps and pumping.

[Experiments with the properties and economics of tufa cements] (*Engin. and Contract., 38 (1912), No. 23, pp. 620–624, figs. 3*).—This article gives the results of tests of the strength and economy of tufa cement, which is ordinary Portland cement mixed with finely ground tufa in varying percentages. The conclusions from these tests are as follows:

(1) The tufa when finely ground with cement and used in concrete combines both chemically and mechanically. (2) Blends of 50 per cent when mixed with sand give greater tensile strength after 10 days than straight cement mixed with the same proportion of sand. The leaner the mixture the greater the relative superiority of tufa cement. In compression the tufa cement concrete is 20 per cent weaker in rich mixtures and as strong in leaner mixtures. (3) Tufa cements in tension of blends from 30 to 80 per cent show a continued growth in strength with age up to 5 years. (4) Tufa concretes must be handled with greater care with reference to both cold and drying, and forms should be left in place about one-third longer. (5) Tufa cement makes a denser and more impervious concrete since the gradation of fineness is carried one step further than in ordinary concrete.

Curves and tabulated test data accompany this report.

Electrolysis of concrete, E. B. Rosa, B. McCollum, and O. S. Peters (*Engin. News, 68 (1912), No. 25, pp. 1162–1170, figs. 3*).—The results are given of a series of laboratory and field experiments on the effects of electric currents in plain and reenforced concrete.

Both anode and cathode effects were observed in reenforced concrete under high and low voltages. In the anode tests it was found that rapid corrosion of the iron took place, sufficient iron oxid forming between the iron and the concrete to cause cracking and disintegration of the concrete. This happened much more quickly and was more marked with the high voltage than a low one, and it is concluded that the rate at which damage occurs decreases with decreasing voltage much more rapidly than the voltage is lowered.

In the cathode tests it was found that the concrete softened and disintegrated for about one-fourth of an inch next to the iron, reducing the bond strength between iron and concrete to about one-fifth of its normal value. This is due to the concentration of the sodium and potassium alkalis in the concrete at the negative terminal, the concentration finally becoming of sufficient strength to attack the cement, destroying the calcium silicates and aluminates, and forming soluble sodium and potassium silicates and aluminates and calcium hydroxid.

The tests with plain concrete indicate that the passage of electric currents does not seriously affect its crushing strength.

It was found that the use of salt or calcium chlorid in concrete, which is done to prevent freezing in cold weather, hastened corrosive action on the reenforcing and that the resistance decreased as the test proceeded. The conclusion is that the presence of salt prevents the precipitation of calcium carbonate at ordinary temperatures so that plugging of the pores and consequent rise in resistance can not occur.

For protective measures it is suggested that salt or calcium chlorid be excluded from concrete and that the surfaces of foundations of concrete structures be water proofed. The wiring of structures should be carefully insulated, especially in small private electric plants, where ground detectors should also be installed.

The effect of hydrogen sulphid on the concrete of sewage disposal plants, W. M. Barr and R. E. Buchanan (*Iowa Engin. Exp. Sta. Bul. 26, 1912, pp. 16, figs. 4; Engin. News, 68 (1912), No. 24, pp. 1095–1097*).—The results of

experimental investigations of the action of hydrogen sulphid on the concrete structures of several sewage disposal plants indicate the following:

(1) In septic tanks hydrogen sulphid is produced by the bacterial decomposition of sulphur-containing proteins and related compounds, and by the bacterial reduction of sulphates which are contained in unusual amounts in the water supplies. (2) The hydrogen sulphid which escapes as a gas from the sewage, particularly in the dosing chamber, is partially dissolved in the moisture on the underside of the roof and concrete walls, where it is oxidized to sulphuric acid, partly by atmospheric oxidation and partly by bacterial action. The sulphuric acid acts upon the calcium compounds in the concrete forming calcium sulphate. This takes up water of crystallization and swells considerably, the result being a cracking and pulverizing action and consequent disintegration of the concrete.

A new process of timber preservation (*Engin. News, 68 (1912), No. 21, p. 954*).—A new preservative treatment for timber is outlined, consisting of melted paraffin with silica in suspension, combined with a certain percentage of naphthalin. The naphthalin causes expansion of the pores and ducts of the wood which expels the moisture and sap contents and draws in the preservative mixture. The mixture upon cooling forms a solid coating of all the interior ducts and pores. Tests indicate that it does not leach out, is impervious to water and all organic acids, and prevents the entrance of the spores which destroy the wood tissue.

The cost of the preservative is about 3 cts. per pound, and tests indicate that a small quantity per cubic foot will completely permeate the material treated.

Tests of the strength of creosoted bridge timbers (*Engin. News, 68 (1912), No. 23, p. 1035*).—A summary of results is given of investigations of the effect of creosote treatment upon the strength of timber.

Directly after treatment the results showed very little difference in the strength of the treated and untreated timbers. One year after treatment the average amount of creosote lost by weathering was 3.7 lbs. per cubic foot, and in all the tests a considerable increase in strength was shown. It is concluded that long-leaf pine timber, which has been subjected to the full cell process of creosoting, is in no way inferior in strength to untreated timber.

Tests with stumping powder, W. H. Lawrence (*Washington Sta. Bul. 7, spec. ser., pp. 118–120*).—Tests were made on cedar standing in a muck soil varying from a few inches to 3 or 4 ft. in depth and underlain with a hard pan or blue clay. The area was too wet to admit of clearing by burning or the char pit method. Some preliminary attempts to remove the stumps by placing 1 charge beneath and at the center of the crown of the stumps were ineffective, since the very wet and loose soil was merely thrown from beneath the stump, thus leaving a depression which immediately filled with water.

In cooperation with the Bureau of Plant Industry of this Department experiments were conducted (E. S. R., 27, p. 189) in which the explosive was placed where deemed necessary and then discharged by an electrical current. Holes were made with a 3 in. auger which would admit of tying 3 of the 1¼ in. sticks of powder together and placing them in the hole at one time. The table of results gives information concerning the kind, size, and condition of the stump and roots, and illustrates the more effective work of a battery in blasting stumps than with the single-load-fuse method.

Tests of wood, paper, and steel pulleys, H. A. Woodworth (*Power, 36 (1912), No. 24, pp. 848–850, figs. 7*).—An account is given of tests made to determine the strength of several 24-inch pulleys of different kinds with a view to disclosing their principal points of weakness.

The pulleys were revolved in a suitable testing plant at speeds varying from 800 to 2,400 revolutions per minute. The wooden pulleys failed at peripheral speeds ranging from 232 ft. per second to 285 ft. per second, and the split-rim wooden pulley had only 80 per cent of the strength of the solid-rim wooden pulley. The paper pulleys failed at peripheral speeds of about 295 ft. per second. The split-steel pulleys failed at peripheral speeds of about 235 ft. per second, but the solid-steel pulleys were revolved at peripheral speeds as high as 389 ft. per second without failure. The conclusions are as follows:

(1) Balancing the pulleys in the rim causes failure at low speeds and thereby lowers the factor of safety. (2) Rim joints midway between arms are serious defects and materially reduce the bursting speed. (3) The solid-web-and-rim paper pulleys will safely withstand a rim speed of 106 ft. per second. By properly strengthening the rim the speed may be materially increased and a sufficient factor of safety retained. (4) Wood pulleys with solid rim have an ample factor of safety and a rim speed of 90 ft. per second if the wood is of good quality. The speed of this pulley may be increased by using lighter bolts at the ends of the arms, as the weight of the bolts caused the original fracture in 90 per cent of the pulleys tested. (5) Wood split pulleys will have a sufficient factor of safety at 72 ft. per second rim speed. The design may be improved by using lighter bolts and discontinuing the practice of balancing in the rim. (6) The solid iron pulleys, if of good iron and free from serious cooling strains, will be safe at a rim speed of 120 ft. per second. (7) Steel pulleys of the split-rim type are unsafe at speeds above 80 ft. per second.

The use of a light iron plow in paddy cultivation, N. WICKRAMARATNE (*Trop. Agr. and Mag. Ceylon Agr. Soc., 39 (1912), No. 5, p. 393*).—The results of 5 comparative tests of the native wooden plow and a light iron plow weighing 28 lbs. for preparing the ground showed that the average yield of grain per acre is from 25 to 50 per cent greater with the iron plow.

The driving of threshing machinery (*Impl. and Mach. Rev., 38 (1912), No. 452, pp. 1034, 1035*).—This gives the results of recent French tests made to compare the cost of threshing by horsepower and by electrical energy. The same thresher was used in each case and was of the stationary type with a simple winnowing attachment. The beater was 1.6 meters long by 0.4 meter in diameter, and the winnower 0.8 meter long and 0.6 meter in width.

Two horses drove the machine at speeds varying from 690 revolutions per minute down to 538 revolutions and threshed 890 sheaves, each weighing 18 lbs., per 10-hour day. By electricity the thresher speed averaged 756 revolutions per minute, threshing 1,275 sheaves per 10-hour day. The electrical consumption averaged 1.74 kilowatts per hour. In both cases four men were required to feed and attend the thresher. The average cost of threshing by horse labor was 1.235 francs per hundred weight, and by electric motor 0.954 franc.

Cool storage of fruit, T. W. KIRK (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 5, pp. 508–515, figs. 7*).—Detailed plans and specifications are given of a storehouse for 4,000 bu. cases of fruit, running 8 hours per day. A smaller plant could be used by running longer hours, but as the first cost is very little greater the money saved by the shorter hours of running would more than compensate for the difference between the smaller plant and this one in a year's work. The cost of the building complete with the machinery as specified is estimated at £1,700 (about $8,250).

The effect of intercepting traps in house drainage, E. WILLIS (*Surveyor, 42 (1912), No. 1091, pp. 826–828*).—This report of experimental investigations deals with the advantages and disadvantages of the intercepting trap, the

chemistry and bacteriology of sewer and drain air, and the ventilation of sewers.

The results of the experiments indicate that the intercepting trap must go, and the following means are suggested to provide for its omission: (1) Improved flushing arrangements whereby rapid discharge of large volumes of water are obtained daily through every portion of the house drainage system; (2) effective double seals on all water closets, slop closets, sinks, lavatories, and baths; (3) effective ventilating pipes clear of the second water seal, and ventilating or puff pipes between the first and second seal; (4) entire abolition of fresh air inlets at or near the ground level; (5) the erection of all ventilating pipes above the ridge of the highest roof immediately adjoining and as far removed as possible from any window; (6) the provision of at least 1 trap of shallow water seal, not less than ½ in. and not more than 1½ in., with provision, by drip tap or otherwise, for always keeping this sealed, and with vent pipe therefrom if the ordinary ventilating pipes were omitted on any branches from internal drains; (7) all waste pipes to be treated similarly to soil pipes as regards double seal traps and ventilation, and the abolition of open heads; and (8) means of efficiently flushing all ventilating and soil pipes.

RURAL ECONOMICS.

Systems of marketing farm products and demand for such products at trade centers, G. K. Holmes (*U. S. Dept. Agr. Rpt. 98, pp. 931*).—This report treats of the movement of farm products from the farm to the consumer, describing each channel in detail. The simplest distribution is the direct one of delivery by farmers to consumer, where the consumer goes to the farm and makes his purchase, or the farmer takes his commodities to town and makes the sales either at the doors of the consumer or at the public market place. Next after this is the delivery by individual farmers or associations of farmers to individual consumers or associations of consumers. Among the varieties of middle men concerned in the marketing of farm products as noted by the report, are country hucksters, the country merchant, grain buyer or local elevator man, and the commission merchant or wholesale dealer. Instances are given showing where marketing transactions frequently involve from 2 to 4 middle men, it being noted for example that onions raised in Kentucky are sometimes bought by a local merchant and shipped to Louisville, where they are put in sacks and consigned to a New York wholesaler, who in turn sells to a retailer, and he to the consumer. Other farm products frequently pass through a similar channel.

Another institution which aids the producer to dispose of his stock is the public warehouse, where the grower or his representative with his produce meets the buyer. Illustrations of this are afforded in the marketing of tobacco in Virginia and North Carolina, wool in the northern Rocky Mountain States, and to some extent rice in Louisiana and Texas.

The report gives considerable space and attention to associative marketing, which is considered the best system under favorable conditions. Among the economic advantages of cooperative marketing noted are the lower freight rate of the carload shipments; the command of transportation facilities by a strong association, perhaps at a time when the individual shipper would be neglected and powerless; the prompt news service with regard to prices and conditions in trade centers, where the association sells its products; the ability of the association to direct shipments in transit to the best markets; uniformity in grading and packing products; and the establishment of a good reputation for quality.

The bulk of the bulletin is made up of a large amount of data and detailed information as to marketing specified crops, type of distribution, market requirements, finding a market, etc. Brief accounts are given of the systems of marketing in vogue in 66 associations, mostly handling fruits and vegetables. Part 2 presents data as to the demand for the various products at the different trade centers.

Report upon cooperation and marketing, J. F. SINCLAIR (*Wis. Bd. Pub. Aff. Adv. Sheets, Coop. and Marketing, 1912, pts. 1, pp. 132; 2, pp. 27; 3, pp. 59; 4, pp. 40*).—These publications present the results of a recent investigation of agricultural cooperation and marketing conditions in the State of Wisconsin, the purpose being to show the possibilities of such cooperation and the dangers to be guarded against. Part 1 treats of agricultural cooperation; part 2, of cooperative credit; part 3, in which C. Hallam is joint author, of municipal markets; and part 4, of distributive or store cooperation. Notes and data are given showing the history and progress of agricultural cooperation in Denmark and Ireland, also what has been accomplished in Wisconsin in the way of cooperative breeding and cow testing associations, live stock shippers' associations, fruit growers' associations, cooperative warehouse elevators, marketing of eggs, and mutual telephone companies.

The appendix to part 1 contains the law enacted by the state legislature in 1911 for forming agricultural cooperative organizations, a list of associations organized under the law, suggested articles of incorporation, by-laws, and farmers' agreements, together with a lengthy bibliography on agricultural cooperation and marketing.

Rural credit, G. K. HOLMES (*Business America, 13 (1913), No. 2, pp. 121–127*).—This article is based largely upon results obtained from a recent investigation conducted by the U. S. Department of Agriculture pertaining to agricultural credit in rural counties of the United States, the information being received from about 9,000 persons, consisting of country bankers, farmers, and country merchants.

According to the reports submitted it is found that 77 per cent of farmers owning their land are able to give good security or indorsed note for a loan, the corresponding percentage of tenants being 46. About 48 per cent of the correspondents reported that farm owners able to give good security or indorsed note are able to obtain short-time loans. The other correspondents reported that 36 per cent of farm owners in their communities are unable to do so because of insufficient opportunities to borrow. Reports from 47 per cent of the correspondents show that such farm owners are able to secure long-time loans, while the remaining correspondents reported that 40 per cent of the farm owners were unable to do so. The corresponding percentages for tenants are about the same.

Reports from 7 per cent of the correspondents show that farmers owning their land who raise cotton do not place a lien on the growing crop to secure advances or supplies, while the remaining correspondents reported that 42 per cent of the farm owners do, and that 52 per cent of them did so 10 years ago. Corresponding data for tenants show 2 per cent, 74 per cent, and 77 per cent, respectively.

It is noted that the local banks supply more than half of the agricultural credit, a large part of the remainder being supplied by general stores. The rates of interest range from 6 to 8 per cent.

The total agricultural debt is estimated at $5,000,000,000, the mortgage debt alone on farms in 1910 being reported at $2,293,160,278 as compared with $1,085,995,960 in 1890, or an increase of over 100 per cent in 20 years, still the

mortgage debt on farms operated by owners in 1890 was 35.5 per cent, and in 1910 only 27.3 per cent, of the value of the mortgaged farms.

The author makes some observations regarding the sufficiency of agricultural credit to supply the demand, the probability of effectively using additional credit if obtainable, and the establishment of large land mortgage companies which would issue long-time bonds against the security of their mortgage loans in mass.

Rural credit in Germany, H. C. PRICE (*Columbus, Ohio, 1913, pp. 31*).—This publication presents in a general way the results of a personal investigation and study of German institutions which furnish both real and personal credit to German agriculture, showing their particular field of operation and the relative importance of each. Brief descriptions are given of the following institutions that furnish what is known as real credit to the farmer: (1) Cooperative land mortgage associations, (2) land credit banks, (3) mortgage banks, (4) public savings banks, (5) insurance companies, (6) provincial auxiliary banks in Prussia, (7) revenue banks in Prussia, and (8) land improvement banks. The institutions described as giving personal credit are (1) Raiffeisen banks and (2) Shulze-Delitzsch banks.

The farmer and finance, M. T. HERRICK (*Atlantic Mo. III (1913), No. 2, pp. 170–178*).—This article presents a lengthy discussion of the financial side of agriculture, showing inadequate facilities for agricultural credit in America as compared with the complete and successful systems of rural credit in a number of foreign countries, the workings of which are fully described and illustrated.

Principles of farm management, H. HAMANN (*Mitt. Landw. Inst. Leipzig, 1912, No. 11, pp. 135–257*).—In addition to describing agricultural conditions in Dresden this article presents in detail notes and data showing the essential factors of farm management and the fundamental relations existing between those factors, as climate, soil, elevation, population, transportation facilities, labor, farm machinery, crop rotation, fertilization, plant and live stock production, etc.

Cost of production, E. C. SEDLMAYR (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 2, pp. 251–270*).—The author discusses and illustrates the relation between agricultural income and the cost of production, showing the proportionate amount of capital required for general running expenses, live stock, machinery, buildings, farm implements, improvements, etc. Concrete illustrations are given showing the cost of producing various agricultural products in Austria. The total cost of producing sugar beets, including seed, fertilizers, labor, farm implements, amortization, maintenance, rent, etc., is estimated at 757.73 crowns per hectare (about $62.27 per acre). Similar notes and data are given as to the cost of producing wheat, barley, milk, and other farm products.

The cost of producing timothy hay on a New Jersey farm, F. S. BARLOW (*Tribune Farmer [New York], 12 (1913), No. 588, pp. 5, 7, fig. 1*).—The details of the cost of growing 509½ tons of hay on 223 acres in 3 successive years are here presented, together with an account of the methods used. The average cost per ton for the 3 years was $13.58, and the average cost per acre $31.38.

Practical farm accounting, Set "B," A. STAUFFER (*Broken Arrow, Okla., 1912, pp. 25*).—This pamphlet presents a simple method of keeping farm accounts, illustrating it by showing some farm transaction for each day of the year.

Rural economy in the Bombay Deccan, G. KEATINGE (*New York, Bombay and Calcutta, 1912, pp. XX+212, pls. 5*).—The author in this volume endeavors to show in detail the circumstances which affect the main factors of production, namely, land, labor, and capital, and correlates them with the question of

markets and prices. He makes a number of suggestions for improving the economic conditions of the farmer through his own efforts, also by means of government assistance.

Charts are given showing the variations of real and nominal wages of agricultural labor in Ahmadnagar for a period of years, fluctuations in the price of grain from 1821 to 1910, and the expansion of cotton cultivation in the Bombay Presidency during the last 40 years.

Constructive rural sociology, J. M. GILLETTE (*New York, 1913, pp. XIII+301, fig. 1*).—The author endeavors in this volume to define the scope of rural sociology by differentiating the difference between rural and urban communities; by distinguishing the types of rural communities in the United States and indicating the physical and social influences which have produced them; by considering the movement of population from country to city and the nature of the moving conditions; by comparing the advantages of country and city; and considering the improvement of agriculture, farm marketing, farm labor, and the farm home, so far as they concern rural community welfare.

A number of tables and illustrations of economic importance are given, among which may be noted are those showing the comparative mortality of the city and rural population; average cost of farm board; rates per hour for labor; hours worked per day by men and horses; cost of keeping horses and horse labor; values consumed per acre from farm machinery; cost of production and feeding forage crops; distribution of profits on agricultural commodities; land tenure in the United States; and percentage of persons owning and renting farm homes.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 15 (1913), No. 1, pp. 8, figs. 8*).—Notes and tables are presented showing the percentage of the marketable potato crop held by growers and dealers on January 1 of each of the last 4 years; average prices paid to producers for potatoes; farm value of imported products on dates indicated; data as to Hawaiian sugar crops for the years ended September 30, 1911 and 1912; area and production of sugar beets in European countries, 1911 and 1912; quotations on ocean freight rates on grain from New York and New Orleans to Liverpool; monthly receipts and stocks of butter and eggs; farm value of important crops; uses made of the corn crop; a list giving number of fairs and exhibitions devoted to agriculture; live stock, and related subjects in 1912 by States and geographic divisions; area of vineyards and production of wine in specified countries; report on cotton ginning; tobacco in the hands of dealers and manufacturers; range of prices of agricultural products at important markets; and acreage, production and value of all crops in the United States, 1899 and 1909.

It is noted that there were 107 persons in Germany in 1907 engaged in agricultural occupations for every 1,000 acres used for agricultural purposes; and that there were 25 such persons to every 1,000 acres of improved land in the United States in 1900.

AGRICULTURAL EDUCATION.

Report of the Development Commissioners on their proceedings during the year ended March 31, 1912 (*Rpt. Develop. Comrs. [Gt. Brit.], 2 (1912), pp. II+76*).—This report continues the work previously noted (E. S. R., 26, p. 101).

The expenditure actually recommended by the commissioners up to March 31, 1912, for agriculture, rural industries, and forestry, is as follows: To the Board of Agriculture and Fisheries, grants for $68,280 for agricultural research, experiments, and technical advice to agriculturists; $455,250 for light horse breed-

ing; $400,000 for the period ending March 31, 1913, for maintenance of farm institutes, this being the first installment of the grant of $1,625,000 for the period ending March 31, 1916; and $14,500 for forestry in England and Wales to the Department of Agriculture and Technical Instruction for Ireland, $17,500 for agricultural research, $100,000 for light horse breeding, $6,800 for forestry, and a loan of $125,000 for forestry; to the Scottish Education Department, $25,000 for extension work at the three Scottish agricultural colleges for 1911–12; to the Agricultural Organization Society of England and Wales, $15,000 for 1911–12; to the Scottish Agricultural Organization Society, $5,000 for 1911–12, for the promotion and maintenance of agricultural cooperative societies throughout Scotland; $15,500 for the extension of the Rothamsted Experiment Station; $4,250 to the British Bee-keepers Association; $1,000 to Cambridge University for the provision of temporary quarters for the staff of the school of forestry; and $55,000 to Edinburgh University for forestry instruction in the university.

The scheme for the extension of the system of agricultural education now approved by the commissioners provides for (1) the division of the whole country into 12 areas which center around the agricultural colleges, and grants to these colleges to enable them to make application of known results to local conditions, and to provide technical advice to local agriculturists, (2) grants to county councils to defray a part of the cost of farm institutes (educational centers which will give short winter courses or similar instruction and vacation courses for teachers of rural subjects in local continuation courses, and which will also be the headquarters of an increased county staff of itinerant teachers, advisers, and organizers) or farm schools for comparatively young boys. The administration of farm institutes and the control and distribution of the grant from the Development Fund for the institutes have been transferred from the Board of Education to the Board of Agriculture and Fisheries. The Treasury has decided that for the present at least, the ordinary teaching work of the agricultural colleges shall be aided, as heretofore, from the Board of Agriculture's regular funds and not from the Development Fund.

The function of the Massachusetts Agricultural College. K. L. BUTTERFIELD (*Mass. Agr. Col. Bul., 4 (1912), No. 1, pp. 5–24*).—In the opinion of the author, "an institution of education supported by the government gains its main purpose from 4 sources: First, from legislation; second, from the historic policy of the college itself; third, from the realization of some fundamental need of society, that may be met by the college; fourth, from the changing aspects of this fundamental need, as expressed in new demands for service, which in turn call for new methods and even new types of work." These four propositions as to the source of an authoritative policy and a few preliminary considerations growing directly out of them are briefly discussed.

The real purpose of this college is defined as "to benefit the agriculture and rural life of Massachusetts, incidentally that of the Nation." The 3 main types of service which the college may render—investigation, instruction, extension, are developed at length. In addition to a discussion of the fundamental task of the college some observations are made concerning the college's relation (1) to the teaching of agriculture in the public schools, (2) to the normal schools, (3) to the board of agriculture, (4) to voluntary associations. It is maintained that "teachers of agriculture in high schools and special schools are clearly to be sought in the agricultural college."

The Lever agricultural extension bill (*Breeder's Gaz., 62 (1912), No. 19, p. 983*).—In commenting on this bill, Eugene Davenport regards the present state of college extension work and the great amount of activity exerted in the form of platform addresses, the special train, and the like, as temporary and

bound to give place to the more permanent things such as: "(1) The experiment station, in the study of agricultural conditions and the discovery of principles of progress; (2) the traveling specialist, with his demonstration field or barn for the illustration and the application of newly found principles to the actual practice of the farm, in order that the findings of the experiment station may be quickly and thoroughly reduced to practice; (3) the agricultural college, in connection with the university, doing strictly collegiate work for those farmers who desire and can obtain a college education, not necessarily to fit them to be farmers, but to fit them to be men also; (4) the agricultural department of the public high school, which will undertake to give the technical training to the masses of men who are to be farmers; (5) a body of agricultural literature, standard and current, of which the agricultural press will form always the advance guard and the principal avenue of contact with the masses of men; (6) the agricultural associations representing more or less formal bodies of leading men engaged in the various commercial activities of agriculture; (7) a more or less closely organized community operating around a center within driving distance, and so conducted as to take care of the community interests—business, social, religious, and otherwise."

Preparation of students for higher agricultural education institutions, J. BESNARD (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 500–504*).—The author discusses preparation in practical agricultural work.

Necessary grades of agricultural instruction on the American continent, C. D. GIROLA (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 425–428*).—The author concludes that agricultural instruction should be included in the course of study of the public schools from the elementary school to the university. The adoption of this plan would reduce agricultural instruction to 3 kinds, viz. practical, to be imparted in practical schools or farms with a minimum of theory and a maximum of practicums, intermediate, in schools of agriculture offering general or special agricultural instruction with proper attention to theoretical studies and their practical application, and higher instruction, to be given in higher institutions or faculties connected with universities, or independent, with the theoretical studies predominating. The courses of study of the 3 classes should so articulate as to lead from the lowest to the highest.

Instruction in zootechny, J. BESNARD (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 490–499*).—General considerations and an outline of a course of study are presented.

Instruction in animal industry in the agricultural colleges of the United States, G. M. ROMMEL (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 381–397, 517–531, pls. 11*).—The latter pages give this address in English. A brief statement concerning the nature of instruction in animal husbandry at the North American agricultural colleges is followed by a more detailed statement of the development of this instruction in the agricultural colleges of the United States, including outlines of courses for students specializing in animal husbandry in the University of Illinois and in the Iowa State College of Agriculture.

Agricultural instruction in Mexico, R. ESCOBAR (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 429–489*).—An account is given of the history of agricultural instruction in Mexico, the courses of study, regulation, etc., of the National School of Agriculture at San Jacinto, including the regional schools of agriculture established by the decree of January 1, 1879, as dependencies of this school, and the organization of agricultural instruction in France, Belgium, Italy, Germany, Denmark, Sweden, Switzerland, Hungary, United States, Chile, Argentina, and Japan.

Agricultural instruction (*Bol. Dir. Gen. Agr.* [*Mexico*], *Rev. Agr.*, *1 (1911), Nos. 7, pp. 597–651; 8, pp. 695–753*).—Data are presented as to the origin of the course of study of the National School of Agriculture and Veterinary Science at San Jacinto, an outline of the subject-matter of the course adopted in 1908, propositions for its reorganization submitted in October, 1909, and the decision of January 17, 1910, authorizing some of the modifications proposed.

Agricultural instruction in the teachers' institute of Montevideo, A. R. MONTERO (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 415–424*).—An account is given of the organization and work of the agricultural experiment field of the two normal institutes, one for men and the other for women, in Montevideo, Uruguay. Agricultural instruction was introduced into the normal institute for men some 15 years ago and into the institute for women about 6 years ago. It has been compulsory in the rural elementary schools for some time.

Special agricultural instruction, R. J. HUERGO (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 398–409*).—The advantages of the special over the general agricultural school are discussed and the plan of reorganization of special agricultural instruction in Argentina is outlined.

Agricultural extension instruction, R. J. HUERGO (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908–9), pp. 353–366*).—The author discusses the objects of agricultural extension instruction and outlines the organization of the agricultural extension service adopted in Argentina in 1908.

The state-controlled agricultural schools of France, D. R. EDWARDES-KER (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 509–515*).—The author gives a brief account of the 3 consecutive classes of agricultural education institutions in France, viz, the practical schools, the national schools, and the National Agricultural Institute, representing, respectively, practice, practice combined with theory, and advanced theory and research. Detailed accounts, based on personal visits, are given of the Practical School of Agriculture at Antibes, the National School of Agriculture at Grignon, and the National School of Horticulture at Versailles.

The Retreat State Farm and School, Deloraine, A. H. BENSON (*Agr. Gaz. Tasmania, 20 (1912), No. 10, pp. 393–405*).—This is a report by the director of agriculture to the minister of agriculture on the establishment and work of the Retreat State Farm and School at Deloraine, Tasmania.

Introduction to the teaching of elementary agriculture (*Trenton, N. J.: Dept. Pub. Instr., 1912, pp. 10*).—This publication presents a plan for beginning agriculture through some specific branch. Leaflets to serve as a guide for the line selected are to be furnished.

Corn growing (*N. J. Dept. Pub. Instr., El. Agr. Leaflet 3, 1912, pp. 10*).—This is one of the leaflets referred to above. Suggestions are given on method of study, material for study, corn growing in school and home gardens, relation of the agricultural work and other school subjects, girls' participation in the study of agriculture, and time to be devoted to the study.

[**Nature-study lessons**], ALICE G. MCCLOSKEY, E. M. TUTTLE ET AL. (*Cornell Rural School Leaflet, 6 (1912), No. 2, pp. 187–202, figs. 10*).—This leaflet contains brief outlines of lessons on winter birds, the potato, the locust tree, and suggestions on corn day in the rural school.

School gardening a fundamental factor in education, L. H. HARVEY (*Moderator-Topics, 33 (1912), No. 15, p. 287*).—It is claimed that soil contact as it reacts upon the child creates producers and fosters adaptability, resourcefulness, and self reliance. Garden work is deemed auto-educative, since the planting and caring for the garden powerfully reflect the child's work and

thought. School gardening instills civic interest and engenders the esthetic, results in developing the faculty of cooperation, constitutes the "missing link" between the home and the school, and gives the child widened interests.

The school garden and fundamentals of education, O. W. CALDWELL (*Nature-Study Rev., 8 (1912), No. 7, pp. 248-252*).—In considering the ways in which gardens appear to relate to fundamentals in education it is maintained that (1) the idea of producing things of value and beauty from the soil gives a motive, (2) the best results are derived when work and study, body and mind, go together, (3) a sense of ownership, pride, and budding independence is developed, (4) the best education in thought power comes through real problems such as are found in gardening, and (5) all the kinds of description—pictorial, verbal, and written—may be based upon garden and other elementary science work. "That knowledge is of most worth, which having led to growth in thought power and efficiency, at the same time leads to efficient productivity in some real work, a knowledge that leads to a belief in the dignity and worthwhileness of productive activity."

The organization of girls' poultry clubs, H. M. LAMON (*U. S. Dept. Agr., Bur. Animal Indus. Circ. 208, pp. 11, figs. 5*).—In addition to directions for organization, this circular offers suggestions concerning prizes and awards, reference literature on poultry, and gives specific information on the management of flocks, marketing eggs, and disposing of surplus birds. It is noted that the work of organizing the girls' poultry clubs described "is to be conducted by the Bureau of Animal Industry in cooperation with the farmers' cooperative demonstration work of the Bureau of Plant Industry."

Method of housekeeping instruction, G. LUNEBURG (*Methodik des Hauswirtschaftlichen Unterricht. Leipsic and Berlin, 1909, pp. 55*).—This book gives a review of the development of housekeeping instruction and discusses the necessity for and importance and objects of this instruction; its place in the curriculum of elementary and continuation schools and its relation to other subjects in the course; subject-matter, method of instruction, and equipment of the school kitchen and other rooms for instruction; the school garden; and the training and examination of teachers of housekeeping subjects.

MISCELLANEOUS.

Twenty-fifth Annual Report of South Carolina Station, 1912 (*South Carolina Sta. Rpt. 1912, pp. 45*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1912, and departmental reports, a portion of that of the chemist being abstracted elsewhere in this issue.

Twenty-second Annual Report of Wyoming Station, 1912 (*Wyoming Sta. Rpt. 1912, pp. 78, figs. 4*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, reports of the director and heads of departments, special articles, and a meteorological summary. The experimental data recorded are for the most part abstracted elsewhere in this issue.

A report covering the work of the Western Washington Experiment Station from November 1, 1907, to April 1, 1911, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 124, figs. 38*).—This reviews the history of this substation, its present equipment, and its various activities. The experimental features are for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Department Library, November-December, 1912 (*U. S. Dept. Agr., Library Mo. Bul., 3 (1912), Nos. 11, pp. 335-364; 12, pp. 367-390*).—These numbers contain data for November and December, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES.

Kentucky Station.—A building for the breeding and rearing of guinea pigs, rabbits, mice, and other small animals has been erected at a cost of approximately $6,000. This building is a story and a half and basement structure of red brick, with slate roof and stone foundation, and is 45 by 30 ft. The basement is cemented throughout and contains the pens and a feed room. On the first floor are 3 infection rooms, a sterilizing room, and 2 laboratories, one of which is for operating and can be kept aseptic. The laboratories and sterilizing room are finished in white enamel.

A new serum laboratory, to cost approximately $11,000, is under construction. This will be a 2-story and basement brick building, 37 by 45 ft. The main floor is to be divided into a sterilizing room, a main laboratory, an operating room, and a room for preparing the animals. The laboratory is expected to be completed about May 1 and will have a capacity of about 200,000 cc. of serum per week.

Dr. R. L. Pontius, assistant veterinarian, resigned March 1.

Maine Station.—The legislature has granted an appropriation of $5,000 per annum for animal husbandry investigations, and it is planned to take up studies as to the inheritance of milk production similar to those under way with egg production. An appropriation of $10,000 was also granted for the purchase of a farm in Aroostook County to be under the control of the station and to be used for plant breeding and other investigations.

The director of the station has been relieved of executive duties connected with the enforcement of the various inspection laws beginning January 1, 1914. He will continue to be in charge of the analytical work.

Massachusetts College.—The college library has begun the issue of library leaflets of selected references along some special line of agriculture. Those now published are respectively for fruit growers, dairymen, and poultrymen.

Missouri University and Station.—The legislature has granted $167,000 to the school of agriculture, of which $25,000 is for a live-stock judging pavilion, $50,000 for the hog-cholera serum work, $30,000 for the station, $25,000 for county farm advisers, $20,000 for soil-test fields, $12,000 for the soil survey, and $5,000 for the State Corn Growers' Association.

Porto Rico Federal Station.—An appropriation of $6,000 has been granted by the insular legislature for the erection of a plant and soil laboratory.

Rhode Island Station.—Director B. L. Hartwell has also been appointed agronomist.

Washington College and Station.—George Severance, of the Puyallup substation, has been appointed head of the department of agriculture in the college and station and acting head of the extension department, and has been succeeded at Puyallup by W. A. Linklater, dean and animal husbandman of the Oklahoma College and Station. John G. Hall, of Clemson College, has been appointed professor of plant pathology in the college and plant pathologist in the station and has entered upon his duties. H. L. Rees, of the Oregon Station, has been appointed plant pathologist at Puyallup, and Benton Stookey assistant agronomist.

EXPERIMENT STATION RECORD.

VOL. XXVIII. MAY, 1913. No. 7.

The interests represented by rural engineering in this country are of large and increasing importance. According to the last census, the valuation in 1910 of farm implements alone was $1,265,149,783, an increase of 68.7 per cent since 1900, and the value of farm buildings was $6,325,451,528, an increase of 77.8 per cent. These items constituted over 18 per cent of the entire value of farm property. The expenditures in irrigation enterprises were estimated at $307,866,369, exclusive of rice-growing areas, and for this one crop $13,667,639 has been invested. Large sums have also been expended in drainage and other land reclamation projects, road and bridge construction, farm water supplies, and other branches, which collectively constitute the activities of rural engineering.

Aside from its direct economic significance through the huge amount of capital involved, the subject is important because of its intimate relations with agricultural efficiency and well-being. A recent compilation of the Bureau of Statistics of this Department indicated that with the introduction of the disk plow, the mechanical seeder, and the combined reaper and thrasher, the average time required for human labor in producing a bushel of wheat declined from 1830 to 1894 from three hours and three minutes to only ten minutes. Such a change profoundly affects the questions of farm labor, the optimum size of farms and the type of farming, and many other factors. The silo and the cream separator have well-nigh revolutionized the dairy industry. Irrigation and drainage enterprises have reclaimed many acres of the desert and the swamp, and improved farm buildings and household conveniences have added much to the comfort and attractiveness of rural life. What is more, the scope of these various activities is constantly expanding as the use of labor-saving machinery and various forms of power increases, and as the farm structures and their fittings become more substantial and improved in character.

The field in rural engineering is, therefore, a broad one, the needs and possibilities for its development by the trained expert exceedingly great, and the responsibilities resting upon those charged with

its advancement correspondingly heavy. All this is coming to be appreciated in Europe, where rural engineering has been comparatively well developed as a distinctive profession through the work of such leaders as Professor Max Ringelmann of the Institute Nationale Agronomique, at Paris, and others. In this country, however, despite the very marked advances within the last few years, we have been depending largely on the general engineer, the implement manufacturer or other commercial interests, or on the farmer himself. The result has been that American ingenuity and skill have achieved a surprising amount of success of a practical, although empirical, nature, but with a dearth of accurate and reliable data for standard practice, and especially of a sound understanding of the application of fundamental principles. In consequence, educators are now confronting a situation in which further development is impeded by the lack of the requisite body of knowledge for instruction, either in the college courses or in extension work, and it is beginning to be realized that this must come mainly from research.

As in every branch of investigation, research in agricultural engineering must be partially in advance of practice. It will concern itself not only with the problems which practice has suggested, but will be constructive in preparing the way for improvements and advancement in agriculture by making available the features essential to such progress. It must, therefore, be along pioneer lines to some extent, and hence it gives abundant opportunity for the exercise of originality, ingenuity, and insight, and for independent investigation.

To be sure, a large and important part of rural engineering is not pure investigation, but consists rather of molding accepted engineering principles into such form that they may be applied to the practical ends of farm life and to the promotion of agriculture in general. There is, however, great need, if it is to be put on a distinctive and authoritative basis, that studies be outlined which will be fundamental both as to their strictly engineering features and as regards the whole field of agriculture itself. If this can be done it will assist the development of new lines of inquiry and place them on a reliable footing, thus broadening the value of the service which rural engineering renders to the art of agriculture.

Engineering researches in general need for their success the assistance or collaboration of the sciences, such as physics, chemistry, and bacteriology. Researches and experimental work in rural engineering require in addition the collaboration of the agricultural sciences, such as agronomy, soils, dairying, and animal husbandry. It is necessary then that the rural engineer so familiarize himself with farm and rural conditions that he may, from the knowledge of engi-

neering and its applications, furnish the suggestive impulse and initiative for investigations which will combine the efforts of the other branches.

One great advantage of the rural engineer is his point of view. He is a connecting link between science and practice. His training and insight enable him to see the problems or the lines along which practical improvements might be made, and at the same time to suggest the procedure by which these improvements may be effected. He is a practical man rather than a theorist—an interpreter of science in practice. The thoughtful, ingenious farmer can suggest many problems and opportunities for improvement so as to make his work and his business more efficient, but he usually has neither the engineering knowledge nor the time to work these matters out. The physicist and the men of other branches of pure science have the knowledge, much of it, and know how to acquire more, but they have not the outlook or the interest to apply it to every-day problems, nor the familiarity which enables them to see these problems and opportunities for betterment. The rural engineer fills this gap and becomes a highly important factor, if he realizes his opportunity and mission and fulfills it.

As has been intimated, progress already made along research lines has been considerable, although fragmentary and uneven. Irrigation and drainage investigations, for example, have been comparatively well developed. The experts of this Office and of several state experiment stations have been studying irrigation and drainage problems for several years and have accumulated considerable data on these subjects. The work has included, among other hydraulic studies, important observations on the amount of ground water, the duty of water in irrigation, and the drainage of irrigated soils. Much experimental work has also been conducted to adapt many of the recognized hydraulic principles not only to large irrigation and drainage enterprises, but to the smaller projects of the individual farmer.

It is, however, only a short time since these subjects have been treated primarily from an engineering basis. The artificial removal of excess moisture from wet soils and the application of water to arid soils have long been recognized by agronomists and soils experts as effective methods of promoting agriculture, but it is only since the application of engineering accuracy in connection with an intimate knowledge of the principles of engineering hydraulics and hydraulic construction that these methods have been placed on an economic and efficient footing. The comprehensive work of the Colorado Station, where elaborate equipment and facilities have been provided for inquiries on such fundamental questions as the measurement and

distribution of irrigation water, factors of evaporation, and the flow of water through pipes may be cited as an illustration of what may be done in this direction.

The disintegration of cement concrete structures in irrigated regions has suggested to several station engineers the advisability of chemical studies of the action of alkali on this material. Such studies have obviously necessitated cooperation with other scientific departments of the institution. For instance, the Wyoming Station is attempting to determine the nature of the chemical changes which cement undergoes when in contact with alkalis and to find a remedy for this reaction. The working out of this project has involved the preparation of cements of known composition and the study of the reactions under controlled conditions of typical salts, separately and in combination. Similar studies have been conducted at the Montana Station. Investigation of this character may be expected to yield results of wide significance as distinguished from mere tests of materials under local conditions and with correspondingly localized applications. Obviously much remains to be learned regarding cement and its use in permanent concrete structures for agricultural purposes.

Notwithstanding the marked advantages of improved road and bridge construction, the latest road statistics available indicate that less than 10 per cent of the total road mileage of the United States has been improved, and the condition of the roads in many of the States is far from satisfactory for agricultural transportation. Few of the experiment stations have dealt with this subject as yet, and what work has been done has been accomplished largely by county commissioners and state highway commissions or the state engineers. Some few States have established methods of construction and maintenance, largely through the efforts of automobilists and some of the more progressive farmers.

The Office of Public Roads of this Department, with its force of engineers, chemists, and other scientists, has been conducting investigations and compiling data, the ultimate object of which is to obtain efficiency and economy in the location, construction, and maintenance of country roads, highways, and bridges. Considerable literature on road and bridge building has been issued by authorities on highway engineering, and there is apparently a wealth of material on the subject, but the problem is apparently so to interpret this information as to make it directly applicable to country road conditions at a cost sufficiently reasonable to be within the reach of rural districts.

All the divisions of rural engineering mentioned have received much more attention than those directly connected with the farm homestead and the work of crop production and harvesting. Farm implements and machinery heretofore have been selected and pur-

chased mainly through the meager knowledge gained by the farmer's association with certain conditions and the claims made by implement dealers, although it is well recognized that the points of view of the manufacturer and the farmer do not always coincide. Very few investigations of farm machinery, conducted on the basis of its mechanical construction and operation, its simplicity and durability, and its applicability to various conditions of soil, crop, and atmosphere have been reported by the experiment stations. Likewise very little literature has been published on the subject from any source, and much more is needed.

The annual motor contest held at Winnipeg has been a source of considerable interest to rural engineers and implement manufacturers and has thrown much light as to the machines best adapted to the conditions of soil most usually encountered, as well as indicating wherein the various types of tractor may be improved. A few other scattered tests of implements have been reported, consisting mostly of calibration tests of planters and seeders and some few dynamometer tests of plows and wagons, but these could well be extended. The American Society of Agricultural Engineers has done considerable work along these lines, as may be seen by reference to its recent programs, and that its work is deemed practical is evidenced by the interest displayed by the manufacturers and designers of agricultural implements and machinery.

A similarly scanty amount of information is available regarding that division of rural engineering which is concerned with the location, arrangement, and equipment of farms, although there have been frequent contributions to the agricultural press from the Nebraska and other stations. Nearly every station has issued a bulletin on the construction of silos, dairy barns, and poultry houses, and the Dairy Division of this Department makes a practice in special cases of issuing detailed plans and specifications of dairy buildings, but other farm buildings have received far less attention. Aside from the reports of some half a dozen stations and a few publications issued by this Department, the available information on this subject is obtained mainly from the agricultural press, and unfortunately much of this is based neither on scientific research nor expert knowledge. Taken as a whole, rural architecture, including design and use of materials, is far behind that of urban and factory types. The fact that its needs do not attract the attention of architects to the extent that structures in business and residential centers do is a special reason why thoughtful study should be given by the rural engineer. The majority of farm buildings are built to-day on the estimates and suggestions of contractors and builders, rather than from the standpoint of economy and efficiency to the owner as determined by expert consideration. For instance, concrete bids fair to become a standard

material for both buildings and roofs, because of its apparent durability, strength, imperviousness, and sanitary qualities, but there is very little reliable data as yet to show what may be done in the direction of its adaptation.

The subject of sanitation in the farm home has been surprisingly neglected in view of its vital importance to the health and happiness of the farmer and his family. Much remains to be done to impress upon him how largely his own health and well-being, as well as in many cases those of the consumers whom he serves, depend upon a water supply free from pollution, and on the collection, purification, and safe disposal of sewage, garbage, and waste. A few of the state stations have issued bulletins on small sewage disposal systems and water supply systems. In some cases, however, difficulty has been experienced in using these publications, since the data apply only to certain average conditions, and too little additional information has been given which would aid the farmer in modifying the designs in order to apply them to his particular needs. However, the suggestions contained in these reports and in the agricultural press have been sufficient to arouse the interest of the farmer and there has been a great demand for reliable information. The Illinois, Minnesota, and Indiana Geological Surveys have issued reports on the conditions of rural water supplies in those States, which indicate that here is another phase of rural home sanitation open for wide investigations. This branch involves chemistry, geology, and bacteriology and is a marked instance of the necessity of collaborating with the sciences.

Other examples might be mentioned which are included in the field of rural engineering, such as heating, ventilating, and lighting the farm home, the harnessing of small water powers, and the generation of power and electricity by small power plants. All of these have heretofore received very little scientific treatment. Much popular literature on these subjects has been published in the agricultural press and has stimulated interest, but for the most part what is available is of slight permanent value since it has little scientific basis and is of limited application.

This cursory survey of the status of research in agricultural engineering is intended to be mainly suggestive of the rich opportunities open to the investigator and to indicate how greatly his work is needed. The growth of extension work and of practical aid to the farmer emphasizes this. There is a growing conviction that this aid should not be narrowly restricted to the phases directly connected with agricultural production. It may be questioned whether any field allied to agriculture is more worthy of consideration to-day, or is more attractive in its promise of returns of immediate practical value and service.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Oxidations and reductions in the animal body, H. D. DAKIN (*London, New York, and Bombay, 1912, pp. VIII+135*).—This volume, which is one of the well-known series of monographs on biochemistry, deals with the following topics: The nature of the oxidizing and reducing agents of the body; methods of investigation; the normal saturated fatty acids; the unsaturated acids; the fatty acids with branched chains; the dibasic acids; the α-amino acids, α-hydroxy acids, and α-ketonic acids; the oxidation of phenylalanin, tyrosin, tryptophan, and related substances; the oxidation and reduction of amino acids by microorganisms; the carbohydrates; the purin derivatives; hydrocarbons, phenols, alcohols, aldehydes, amins, and indol derivatives. A very large bibliography is included.

Colloid chemistry and its significance for food chemistry, A. THIEL (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 1–2, pp. 171–187*).—This is a discussion of the fundamentals of colloid chemistry, important results obtained from its use, colloid reactions, and the application of colloid chemistry to problems in food chemistry.

The conditions for complete hydrolysis of proteins, D. D. VAN SLYKE (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 295–299*).—Casein, edestin, wheat gliadin, egg albumin, ox hemoglobin, and wheat gluten were used in the experiments reported.

According to the author, "the percentage of amino nitrogen reaches a definite maximum when acid hydrolysis of a protein is complete, and this maximum is the same whether the hydrolysis occurs at 100 or at 150°."

The coloring matter of egg yolk or ovochromin, N. A. BARBIERI (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 25, pp. 1726–1729; abs. in Jour. Chem. Soc. [London], 102 (1912). No. 598, II, p. 783*).—"The yolks of 2,000 eggs are left in contact with carbon disulphid for several days, and the solution so obtained is treated with excess of alcohol. The alcoholic solution is filtered, and the alcohol distilled off. The semisolid residue is taken up with chloroform giving three layers: (a) an aqueous layer, which contains the coloring matter; (b) a white solid layer of paravitellin; (c) a chloroform layer. From the aqueous solution, the ovochromin can be obtained by extraction with acetone and redissolving in water after distilling off the acetone, this process being repeated until all sodium chlorid is removed. A simpler method is to submit the liquid to polydialysis and subsequent evaporation at 37° C.

"Ovochromin is a yellow, colorless, very hygroscopic powder. It is soluble in its own weight of water, but insoluble in all the ordinary organic solvents. In aqueous solution it has no characteristic absorption band, and gives no biuret reaction. Hydrogen peroxid decolorizes it. Alkalis and concentrated acids have no action in the cold. It decomposes without melting at 270°, and is not toxic."

Studies in the chlorophyll group.—XIV, In regard to the duality of chlorophyll and the variations in its components, C. A. JACOBSON and L. MARCHLEWSKI (*Amer. Chem. Jour., 47 (1912), No. 3, pp. 221–231, pls. 7 Biochem. Ztschr., 39 (1912), No. 3–4, pp. 174–184*).—In this work the authors point out that the ratio of neochlorophyll to allochlorophyll is a variable quantity, dependent not only upon the nature of the plant under examination but also upon the leaves of the same plant as influenced by external conditions.

The volatile aliphatic acids of corn silage, A. W. DOX and R. E. NEIDIG (*Iowa Sta. Research Bul. 7, pp. 5–32*).—The authors find 3 possible sources of the fatty acids present in corn silage, viz, putrefaction of protein, hydrolysis of fats, and fermentation of carbohydrates. The most important source is the last-named, and in all probability the changes which the carbohydrates undergo are the basis of silage formation. The complex polysaccharids are apparently first converted into hexoses, but the conversion of hexose into fatty acids is a process which, at the present time, is very little understood.

In this work silage prepared in brick, hollow tile, and wooden silos was examined with the Duclaux method, but by using this method the authors were able to bear out the validity of Jensen's conclusion that a certain amount of lactic acid is volatilized with steam at 100° C. and at ordinary pressure. The method was then modified, so that instead of using suspensions of the silage in water, the juice obtained with a Buchner press was used, and it was found that the acidity did not vary with the amount of pressure used for obtaining the juice. The steam distillation was also done under diminished pressure. Under these conditions lactic acid is entirely nonvolatile.

"The carbon dioxid present in silage juice passes over with the first distillate, but on neutralizing with barium hydroxid it is precipitated and can be removed by filtration.

"Acetic acid is first in importance of the volatile acids of silage. In our samples it comprised about nine-tenths of all the volatile acid present.

"The Duclaux determinations show that propionic acid was uniformly present in appreciable quantities in the various samples of silage examined. Fractional distillation of the mixed acids confirmed this conclusion. The origin of the propionic acid is a subject that awaits further investigation. Bacterial reduction of lactic acid is known to give rise to propionic, and this reaction is offered as a tentative explanation. The failure of previous investigators to note propionic acid as an important constituent of silage, may be due to its absence from the samples examined or to inadequate methods of analysis." The samples were taken at intervals from the silos and evidence pointing to the presence of propionic acid was invariably obtained.

"Butyric acid was not found in any considerable quantity, except in one sample that was not in first-class condition. In this sample butyric acid was manifest by its odor. We suggest accordingly the possibility that the relative amount of butyric acid may be one of the distinguishing features between good and poor silage. This suggestion is in harmony with the work of Manns [E. S. R., 1, p. 200].

"Isobutyric acid was probably not present in any appreciable quantity. We determined the Duclaux constants for this acid and found them much higher than those for butyric acid. Formic acid was found in several samples in small amounts.

"The alcohols of silage were found to occur in the same order of importance as their corresponding acids; thus ethyl alcohol was present in greatest amount, then propyl, and lastly higher alcohols only in traces. Esters occurred only in traces. The sample of spoiled silage contained practically no volatile acid, either in the free state or in the form of salts."

The volatile aliphatic acids of corn silage, A. W. Dox and R. E. Neidig (*Jour. Amer. Chem. Soc., 35 (1913), No. 1, pp. 90–93*).—In contrast to the findings of Hart and Willaman (E. S. R., 28, p. 109) the authors found only traces of formic acid and no evidence whatever of methyl alcohol.

It is pointed out that "inasmuch as the volatile acids are present in silage for the most part in the free state, the addition of 10 cc. concentrated sulphuric acid to 2 liters of the suspension (practically 1 per cent sulphuric acid) is not only unnecessary but highly objectionable. It is a well-known fact that the hexose sugars, which are present in silage or could easily result from hydrolysis of the starch, are decomposed by mineral acids into levulinic acid and formic acid. The formic acid thus produced would distill over and perhaps also some of the levulinic.

"When suspended particles of silage are distilled, the recovery of volatile acid is necessarily slow on account of the time taken for diffusion into the surrounding medium. This would account, in part at least, for the difficulty mentioned by Hart and Willaman in obtaining a neutral distillate after collecting 3 liters. Another objection to using a suspension of silage is that the cellulose, pentosans and other insoluble matter are subjected to the action of the sulphuric acid. Hart and Willaman find aldehyde in their alcoholic fraction. In our experiments under the same conditions considerable furfural was found. This, on oxidation, would yield pyromucic acid, which would pass into the distillate and probably be calculated into methyl alcohol."

The method taken to eliminate the errors is described in the abstract above.

Some new properties of peroxidases and their action in the absence of peroxids, J. Wolff (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 14, pp. 618–620*).—Orcin, in the presence of sodium hydroxid or salts giving an alkaline reaction and in the absence of peroxids, will absorb oxygen from the air, but when a vegetable extract is added the absorption can be increased, in some instances from four to fivefold. Other phenols were tried in this respect, and resorcin was found to be much less active than orcin. If the amount of fluid surface is increased or lessened the results obtained vary accordingly.

Action of small amounts of hydrogen peroxid upon the saccharification of soluble starch (Fernbach–Wolff) by vegetable and animal ferments, C. Gerber (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 21, pp. 946–948*).—A continuation of work previously noted (E. S. R., 27, p. 109).

Influence of halogens upon the action of coagulating and amylolytic enzyms, C. Gerber (*Compt. Rend. Soc. Biol. [Paris], 72 (1912), No. 24, pp. 1112–1118*).—In these articles are considered (1) the caseification of milk by vegetable, animal, and proteolytic ferments in the presence of increasing amounts of iodids; (2) caseification of milk by rennet with a fixed amount of enzym of either vegetable or animal origin with the previous addition of increasing amounts of iodids (the action of free iodin being compared with that of mercuric acetate); and (3) the influence of iodin upon saccharification of starch by vegetable and animal amylases.

The synthesizing and hydrolyzing actions of emulsin in alcoholic solution, E. Bourquelot and M. Bridel (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 25, pp. 1737–1739; Jour. Pharm. et Chim., 7 ser., 6 (1912), No. 1, pp. 13–18; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, I, p. 672*).—When emulsin acts on a solution of dextrose in 85 per cent alcohol B-ethyl glucosid is produced, but when the dextrose is an aqueous solution it acts as a hydrolytic. The B-ethyl glucosid so obtained can be converted into d-isomerid by the action of alcoholic hydrogen chlorid. A similar synthesizing action is noted when dextrose is present in methyl, propyl, and isobutyl alcohols, and

under these conditions it gives the corresponding glucosid. When emulsin acts on a glucosid in an alcoholic solution the first result noted is the hydrolysis of the glucosid, then the dextrose which is produced unites with the alcohol, at once forming an alkyl glucosid.

Studies on lipase, Y. TANAKA (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 11 (1912), Sect. Vd, pp. 37–43*).—These experiments were conducted for the purpose of ascertaining whether the addition of an acid has any lipolytic action upon the constituents of castor beans.

The results showed that lipase exists in the seeds in the state of an inactive zymogen and that the addition of a dilute acid liberates the active enzym. Lipase was most active in a neutral medium and was insoluble in water. Lipolytic activity was found to be greatly increased by the addition of a small quantity of either sodium chlorid, potassium sulphate, ammonium chlorid, or manganese sulphate. Calcium, barium, magnesium, and especially copper had an inhibitory influence. The decomposition products of proteins, such as leucin or asparagin, also had an accelerating effect upon the lipolytic action, while the proteins, gelatin, and neutralized egg albumin were apparently without effect in this regard. The presence of castor-bean extract seemed also to accelerate the activity of lipase but this may be ascribed to both the mineral salts and certain proteins, but not to globulin or other coagulable proteins.

The method of preparing a powdered lipase is given in detail.

Improved process for drying animal and plant liquids, organ suspensions, etc., with anhydrous sodium sulphate, V. NJEGOVAN (*Biochem. Ztschr., 43 (1912), No. 3, pp. 203–206; abs. in Chem. Abs., 6 (1912), No. 19, p. 2766*).—The material in question is mixed and comminuted with sufficient anhydrous sodium sulphate to combine with all the water present and then dried in a vacuum desiccator of sulphuric acid. The substance which is obtained in a readily pulverizable condition can be extracted with a suitable organic solvent. See also a previous note (E. S. R., 24, p. 515).

Studies on the phenoldisulphonic acid method for determining nitrates in soils, C. B. LIPMAN and L. T. SHARP (*Univ. Cal. Pubs. Agr. Sci., 1 (1912), No. 2, pp. 21–37*).—"The 'alkali' salts NaCl and Na_2SO_4 induce losses of nitrates when the latter are determined by the phenoldisulphonic acid method. Na_2CO_3 has no such effect. NaCl induces much greater losses than Na_2SO_4. Among the substances used to coagulate clay and organic matter from solutions in which nitrates are to be determined, potash alum, aluminum cream, and bone black have been found decidedly unreliable. They all induce large losses of nitrates. Lime has been found to be much more reliable for the purpose named than any of the other substances, the losses incurred through its use being very small.

"The reason for the difference between the action of Na_2SO_4 and Na_2CO_3, so far as the nitrate losses are concerned, is to be found in the fact that Na_2SO_4 induces the loss of nitric acid from the solution while the latter is being evaporated, while Na_2CO_3 containing only a weak acid radicle has no power to set nitric acid free. Neither Na_2SO_4 nor Na_2CO_3 has the power to set nitric acid free from nitrates when the dry residues of the two are mixed prior to treatment with phenoldisulphonic acid. Losses of nitrates from solutions as induced by chlorid alone seem to be proportional to the amount of chlorin present. The work of Gill [E. S. R., 6, p. 189], which showed that chlorin induces losses both on the water bath and in mixing the dry residue with phenoldisulphonic acid, is confirmed."

The phosphomolybdate estimation of phosphoric acid in soils, S. J. M. AULD (*Analyst, 37 (1912), No. 433, pp. 130–137*).—"Owing to the difficulty of

controlling the amount of ammonium salts present, and the possible variation of the amount of combined ammonia, methods of weighing the phosphomolybdate precipitate direct should be avoided. If used, Carnot's method should be employed, using the factor 0.0378.

"If the precipitate is dissolved in ammonia, the difficulty of removing ammonium salts without, in practice, decomposing the residue to an indefinite extent renders it desirable to weigh the residue in the uniformly blue condition. In the ordinary method of heating till partially blue, the factor used should be 0.0389; if heated until quite blue 0.0393.

"Since ammonia splits up the ordinary phosphomolybdate precipitate on solution, and the P_2O_5 content of the residue may be subject to variation, it is best to reprecipitate the ammoniacal solution with nitric acid, filter through a Gooch crucible, wash, and ignite the residue until dark blue in color and of constant weight. Factor=0.0396. As a quicker method of carrying out the operation, the reprecipitated phosphomolybdate may be washed by decantation, evaporated to dryness on the water bath, and the residue ignited direct, using the same coefficient for calculating the result."

The iron content of human and cow's milk, F. V. Soxhlet (*München. Med. Wchnschr., 59 (1912), No. 28, pp. 1529–1532; abs. in Chem. Abs., 6 (1912), No. 19, p. 2775*).—The iron content of human and cow's milk was determined by Zega's method.[a]

Twenty-six samples of cow's milk contained between 0.25 and 1.2 mg. with an average of 0.6 mg. Fe_2O_3 per liter. Feeding fatty acid iron combinations to a goat in increasing amounts, so that 3 gm. of Fe_2O_3 in this form was fed on the twenty-third day (a total of 16 gm. iron having been given) only increased the iron content of the milk from 0.4 mg. to from 0.6 to 0.7 mg., practically all of the iron being excreted in the feces. Feeding 1550 gm. hemoglobin in 7 days containing 6.5 gm. Fe_2O_3 (150 to 400 gm. daily) only increased the content from 0.6 mg. to from 0.7 to 0.9 mg. Fe_2O_3. Of the iron fed in this form 95 per cent was excreted in the feces as inorganic iron.

Seven samples of early human milk, 6 taken between the fourth to seventh day and 1 at the fifth week after birth, contained between 1.2 and 2.2 mg. or an average of 1.7 mg. Fe_2O_3 per liter. Two other human milks, the time after birth not noted, contained 1.3 and 1.6 mg. A sample of milk 7 months after birth yielded 1.5 mg.

The catalases in cow's milk and their hygienic significance, H. Bertin-Sans and E. Gaujoux (*Rev. Hyg. et Pol. Sanit., 34 (1912), No. 10, pp. 1020–1029*).—Sarthou's method (E. S. R., 23, p. 309) is deemed accurate, rapid, and simple and is recommended for practical work. Interpreting the figures obtained with the test the following limits are laid down: (1) Ten cc. of sanitary milk should not disengage more than 1 cc. of oxygen. (2) Pasteurized milk which has been properly kept should not deliver more than 0.5 cc. of oxygen (sterilized milk much less). (3) All milks which evolve more than from 1.5 to 2 cc. of oxygen should not be used for infant feeding purposes. (4) Milks yielding from 3 to 4 cc. of oxygen are unsatisfactory for human consumption of any kind.

A convenient method of conducting Storch's reaction, J. Tillmans (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 1–2, pp. 61–64*).—Storch's reaction for differentiating boiled from raw milk (E. S. R., 10, pp. 384, 385) possesses the disadvantage of requiring work with very dilute solutions. As a simpler procedure the following method is proposed:

[a] Chem. Ztg., 17 (1893), No. 85, pp. 1564, 1565.

Into a beaker pour from 10 to 20 cc. of the milk under examination and then add with a salt or pepper shaker a little p-phenylandiamin and barium peroxid. When the milk is raw, a green, deep-blue color ensues, except that when too much barium peroxid is used a red color is produced. Boiled milk remains colorless. In a mixture of milk containing 5 per cent raw milk a positive reaction is obtained within 2 minutes.

Proposals for the unification of analytical methods for cheese (*The Hague: Study Com. Internat. Dairy Fed., 1912, pp. 4, pls. 2*).—The methods proposed by the Study Committee of the International Dairy Federation are as follows:

(1) Determination of water in cheese: Five gm. of cheese is dried at the ordinary temperature, if possible in vacuum, for at least 16 hours, and immediately afterwards dried for about 1 hour in an oven at 105° C. and weighed. The drying is continued and the weighing repeated at intervals of one-half hour until constant weight is obtained. (2) Determination of fat in cheese: (a) Gerber's method, using van Gulik's modified cheese butyrometer for 3 gm. of cheese; (b) the hydrochloric acid method; (c) Smetham's perforation method and the modified Schmidt-Bondzynski method.

The butyrometer and extractors employed are illustrated.

Quantitative determination of water in cheese, C. Mai and E. Rheinberger (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 1–2, pp. 125–131, fig. 1*).—After pointing out the deficiencies of the various methods for this purpose the authors report their results with a distillation method which has been previously used for other food products (E. S. R., 18, p. 419; 20, p. 1009 (Kreis); 21, p. 210). The apparatus consists of an Erlenmeyer flask for holding the cheese sample, a Liebig condenser, and a graduated receiver for the distillate. The cheese sample is mixed with petroleum for distillation.

Investigations on methods of analysis of cane products, W. E. Cross (*Louisiana Stas. Bul. 135, pp. 83, fig. 3*).—These are a series of papers which deal with the results of investigations made with various methods of analysis for sugar cane products.

The first is on the use of the refractometer in sugar-house work, especially for the determination of the dry substance and moisture in cane products. It is pointed out that "the refractometric method is one of great value and reliability in determining the dry substance of all sugar-house products: Juices, sirups, molasses, massecuites, and sugars. For some determinations the Abbé refractometer is specially adapted, while for others the immersion instrument is most suitable, but if the instruments are standardized with each other, they can be used in conjunction for sugar-house control. The refractometric method ensures higher accuracy as well as a greater simplicity of working than the older methods."

In chapter 2 the application of dry lead defecation to sugar-house analysis is considered. This calls attention to the fact that the ordinary method of clarifying sugar solutions by adding lead subacetate solutions and then filling up to the mark with water, introduces a slight error, due to the contraction in volume, and, consequently, too high polarization results are obtained. The results obtained with the use of dry lead as a defecating agent, as suggested by Horne (E. S. R., 15, p. 848), are theoretically more correct than those obtained by the official method, but are identical when considered on a practical basis. The use of the dry lead minimizes the experimental error and allows much quicker operation in routine work. It can also be used in the analysis of sirups, sugars, and molasses. "In ordinary work the use of excessive amounts of clarifying agent, be it dry lead or lead subacetate solution, is very undesirable, as in this way variations in the polarization values are

obtained which seriously detract from the value of an analysis. Care should be taken, therefore, to add only just sufficient of the clarifying agent to produce the desired precipitation of impurities, etc."

Chapter 3, on a rapid method for the determination of glucose in juices, shows that much time can be saved if the juice is measured out instead of weighed, and that if the operation is performed carefully very good accuracy is attainable. The procedure is the same as with the ordinary method, the percentage of glucose being obtained from a conversion table which is given.

In chapter 4 a modification of the Clerget method for accurately determining sucrose in molasses, in which W. G. Taggart is joint author, is described as follows: The normal weight of molasses is dissolved and made up to 200 cc. A convenient quantity of this is treated with the necessary excess of dry lead subacetate and filtered. To the filtrate is added sufficient dry finely powdered dehydrated oxalic acid (obtained by heating the powdered acid to 70° C. for some time and regrinding) to precipitate almost all the lead present in solution, and the mixture refiltered. If too much oxalic acid is added, the filtration is rendered difficult. The single polarization and Clerget determinations are made with this solution.

"It was found that too great an excess of lead should be avoided, as the Clerget result falls slightly after a certain excess has been reached. The maximum decolorization, however, is produced by an excess which is too small to affect the Clerget result in this way. Our results confirmed also those of previous investigators in showing the increase in polarization brought about by excess of lead in alkaline solution, and also in showing that the normal polarization is usually restored by acidifying the solution. The use of small quantities of zinc dust in decolorizing dark inverted solutions is recommended. In conjunction with the method advanced above, the factor for Clerget determination should be modified for varying concentrations of sucrose according to the tables given."

Chapter 5 deals with the effect of urea and betain on the rate of inversion of sucrose by hydrochloric acid, and has been noted from another source (E. S. R., 27, p. 508).

Knowing the importance of a direct method for determining sucrose in the presence of reducing sugars, the author and W. G. Taggart undertook (chapter 6) to determine whether the Pellet-Lemeland method (E. S. R., 27, p. 812) could be used for routine work in the sugar laboratory. The results obtained were not entirely satisfactory with molasses, sirups, etc., and no greater accurancy was obtained when the time of heating was changed. The extreme dilution necessary in the Pellet-Lemeland method was eliminated, and the following is the method as finally modified: "The normal weight of product is weighed into a 100 cc. flask, the solution filled up to mark, and 50 cc. thereof transferred to another 100 cc. flask, where 6.3 cc. sodium hydroxid solution (36° Beaumé), 7.5 cc. hydrogen peroxid (30 per cent by weight, 100 per cent by volume) is added. Careful cooling is necessary to prevent a too violent effervescence, and ether from a dropping bottle can be used to advantage in preventing excessive foaming. Cooling in cold water or ice is helpful in moderating the sometimes vigorous reaction. After effervescence has almost stopped, the flask is kept immersed in a water bath at 55° for 20 minutes. Thereupon the liquid is cooled, made slightly acid with acetic acid and made up to mark. After clarification with dry lead subacetate and filtering, the solution is polarized." If polarized in a 400 cm. tube the percentage of sucrose is read off directly, while the use of 200 cm. tube entails multiplication of the reading by 2. "The solution obtained in all cases, at the end of the operation, is almost colorless and quite clear and bright. Con-

siderable latitude is permissible in the concentration and method of working used."

The results obtained by this method have been found to be reliable and it is offered as a substitute for the Clerget method in sugar-house work in certain cases. "It could be used for the analysis of sirups and molasses in sugar-house control, especially in estimating the amount of sugar in low-grade products like hot room goods, as a very good value for actual sucrose present is thus obtained."

The acidity of raw cane sugars (chapter 7) was found to vary within very wide limits, due to the method of manufacture used. A large amount of data are deemed necessary to determine the relation between acidity and the spoilage of cane sugar. The method of titration for acidity is given.

In some notes on the analysis and working of sour cane (chapter 8) it is pointed out "that when fermentation has proceeded beyond a certain stage, the difficulty of working the juice, and the much decreased yield obtained, will make the economical extraction of sugar from the juice impossible. At just what point this happens is a hard matter to decide. It depends not only upon the degree of fermentation, but on its nature. When the fermentation is mainly acid it will be more easily noticeable than when much gum is present."

The criteria to judge the degree of fermentation which the cane has undergone are the acidity, gum content of the juice, and the purity. The methods deemed most suitable for this are given.

"The acids formed by the fermentation give, with lime, salts which are for the most part soluble and present right through to the molasses. As the melassagenic power of such lime salts is greater than that of the corresponding sodium salts, there is an obvious advantage in neutralizing some of the excessive acidity with soda. Caustic soda can be used, but the carbonate is cheaper, easier to handle, and in other ways more desirable. Of course, the necessary amount of lime for removing the impurities must be added, as soda has by no means the same purifying action as lime.

"The difficulty in boiling and the stiffness of sirups, etc., from sour cane comes in large part from the presence of the gums produced by the fermentation. There is no known way of removing these gums; it is therefore all the more necessary to keep down fermentation as far as possible from the time the juice enters the sugar-house."

The appendix of the bulletin contains numerous conversion and correction tables.

Refractive index as a measure of dry substance in saccharin products, A. H. BRYAN (*Proc. Ind. Acad. Sci., 1909, pp. 165–173, fig. 1*).—This is a statement of the average figures obtained for the refractive index of the dry substance of maple sirup, cane sirup, honey, cane molasses, commercial glucose and beet molasses. Eighty-one samples in all were examined. The heatable prism instrument in use at the present day is pictured.

Fermentation saccharometer, H. SERGER (*Ztschr. Öffentl. Chem., 18 (1912), No. 18, pp. 355–358, figs. 8*).—A review of the different kinds of saccharometers used at the present time, including those of Einhorn, Weidenkaff, Fiebig, Poldenstern, Lohnstein, Wagner, Dominikiewicz, and Wiedmann.

Determination of total solids in vinegar, P. LEHMANN and F. GERUM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 23 (1912), No. 6, pp. 267–274*).—Like wine, vinegar yields incorrect results for its extract content, and the value designated as "apparent extract" can be of use only when the specific gravity of the "apparent extract" is not below 1. In general the method can be used as a rapid means of examining many samples, as the indirect determination of the extract will give the true value of the real extract content, and this method

should serve as a control for the figures obtained by the direct weighing method. Oudemann's tables should be used in conjunction with the indirect method.

In determining the "apparent extract" the percentage of acetic acid found is multiplied by 0.0015 and the product obtained subtracted for the specific gravity of the solution of extract. For determining the extract indirectly 50 cc. of the vinegar is evaporated to a bulk of from 10 to 15 cc., transferred to a picnometer and filled up to the mark with water, and the weight of the contents of the picnometer determined. The solution of the extract is then titrated with normal potassium hydroxid solution, and the number of cubic centimeters used multiplied by 0.00018. The difference between the two values represents the specific gravity of the extract solution, and when referred to the table will show the percentage of extract contained in the vinegar.

The data noted above were obtained with synthetic solutions containing glucose, starch, sirup, invert sugar, etc.

The value of the complement fixation reaction for detecting horse meat in bologna, G. SEIFFERT (*Ztschr. Hyg. u. Infektionskrank., 71 (1912), No. 3, pp. 547–559; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 10, p. 219*).—The complement fixation reaction is positive where the precipitin test is positive. It is the more sensitive, but owing to difficulties in execution it can not entirely displace the precipitation test.

The crude fiber content of flours and brans, K. BUDAI (*Kisérlet. Közlem., 15 (1912), No. 3, pp. 309–327*).—A description of a new method for determining the crude fiber in flours and brans, in which the losses sustained during the operation are reduced and the process of boiling with alkali, whereby lignin and other cellulose-like substances belonging to the seed coats of cereals are destructed, is eliminated. The figures obtained with the method, according to the author, can be used for a rational classification of the varieties of flour. The method is as follows:

Three gm. of flour is shaken with 200 cc. of sulphuric acid (50 cc. of 5 per cent sulphuric acid + 150 cc. of water) in an Erlenmeyer flask having a capacity of from 700 to 750 cc. After allowing the flask to stand for a few minutes it is heated on an asbestos wire gauze over a small flame, then boiled vigorously for one-half hour, replenishing the evaporated water from time to time. Next, 15 cc. of a 30 per cent solution of sodium hydroxid is added and filtered rapidly through a large porcelain Gooch filter with the aid of the suction pump. The crude fiber held on the filter is washed successively with hot water, alcohol, and ether, dried, and then weighed. After ashing the residue the calculation is the usual one.

Determination of cellulose in animal feces, K. BUDAI (*Kisérlet. Közlem., 15 (1912), No. 3, pp. 328–334*).—This is the same method as noted above.

Determination of cellulose in feeding stuffs, K. BUDAI (*Kisérlet. Közlem., 15 (1912), No. 3, pp. 335–362*).—This is practically the same method as noted above.

Factory method for the determination of total fatty acids in cotton-seed foots, F. N. SMALLEY (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 11 (1912), Sect. Vd, pp. 27–29*).—The official method of the Interstate Cotton Seed Crushers Association is considered the most accurate method, but it takes too long for its execution and is therefore almost useless for factory control purposes. The iodin method which has been in almost continuous use for several years in cotton-seed oil refineries gave very satisfactory results.

"After the sample has been well mixed, weigh out accurately 0.5 gm. on to a small square of fat-free paper. This is then introduced into a ground glass stoppered bottle with neck so arranged that the joint can be sealed with the

potassium iodid solution. Five cc. of carbon tetrachlorid and 20 cc. of Wijs' iodin solution are added. The bottle is stoppered and the contents gently shaken until the soap stock is in solution. Seal with potassium-iodid solution and allow to stand for 30 minutes. The determination of the iodin number is now carried out in the usual Wijs method, and the resultant number is converted by division by 1.24 into per cent fatty acids. The factor was arrived at by comparison of the iodin number with the total fatty acids as determined by the official method as before outlined. Some 150 samples were analyzed by both methods before the final selection of the factor was made."

Investigation of the methods for the determination of total fatty acids in cotton-seed foots, F. N. SMALLEY (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 11 (1912), Sect. Vd, pp. 31–35*).—"The author concludes that the most accurate method is that of the official interstate method with the following modification. For the solution of the crude fat, transfer the fatty acids on the filter paper back to the original beaker and dissolve by the addition of 100 cc. of gasoline with a few minutes boiling on the electric hot plate. This is then filtered through dry paper and the residue treated with successive smaller portions of gasoline until the fat is thoroughly dissolved. In case only two such extractions are given, it is recommended that the filter paper with the residue be given an extraction in a Soxhlet apparatus."

Examination and judgment of condition powders, O. v. CZADEK (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 8, pp. 1037, 1038*).—The author concludes that the selection of qualitative and quantitative methods must be left largely to the analyst because general directions and methods for examining this kind of material are hard to compile. The inorganic and organic substances noted as entering into the composition of condition powders are as follows: Salt, feed lime, bone ash, Glauber salts, epsom salts, sulphur, antimony sulphid, arsenic, calcium carbonate, sodium bicarbonate, fenugreek, gentian, calamus, fennel, buckthorn bark, anise, St. John's bread, licorice root, marshmallow root and leaves, senna leaves, peppermint, wormwood, juniper berries, and sage. Less frequently small amounts of oil-cake meals are introduced. The diluents or fillers employed as a rule are bran, feed meal, rice spelts or hulls, and millet hulls.

The use of lactic acid and lactic acid bacteria for pickling cucumbers, A. KOSSOWICZ (*Ztschr. Gärungsphysiol., 2 (1912), No. 1, pp. 78–80*).—Faulty fermentation often causes softness, bitterness, and hollowness in cucumbers. In these abnormal fermentations the bacteria of the mesenteric group are especially active. The addition of lactic acid bacteria cultures or from 0.4 to 0.5 per cent of lactic acid will prevent the development of these organisms. It is not absolutely necessary to have lactic acid cultures from pickled cucumbers, as those obtained from sauerkraut, pickled onions, or milk products may be used.

About hardened or solidified oils, A. BÖMER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 1–2, pp. 104–113*).—During the last few years hardened oils have been placed upon the market. The method of preparing them rests chiefly upon the fact that when an oil is submitted to the action of hydrogen in combination with a contact substance (catalyzer) the unsaturated fatty acids or their glycerids are converted into saturated compounds, such as stearic acid, etc. In this work the author studied the physical and chemical constants of hardened sesame, peanut, and cotton-seed oils, and has compared them with the untreated natural oils. A discussion is appended in regard to the use of these products for human consumption.

Yearly report in regard to the progress made in agricultural chemistry, T. DIETRICH (*Jahresber. Agr. Chem., 3. ser., 14 (1911), pp. XXXIV+675*).—This is a continuation of the work previously noted (E. S. R., 27, p. 14).

METEOROLOGY—WATER.

On the physics of the atmosphere, W. J. HUMPHREYS (*Jour. Franklin Inst., 175 (1913), No. 3, pp. 207–244, figs. 13*).—The subject is discussed from the standpoint of meteorology as a branch of applied physics, and a few fundamental facts and problems which illustrate this point of view are set forth.

The weather in Germany in 1912, A. BOOSS (*Gartenflora, 62 (1913), No. 4, pp. 78–84*).—This is a brief general account of weather conditions during the year.

The underground waters of southwestern Ohio, M. L. FULLER, F. G. CLAPP, and R. B. DOLE (*U. S. Geol. Survey, Water-Supply Paper 259, pp. 228, pls. 9, figs. 11*).—The work recorded in this bulletin "included the geologic tracing and correlation of the rock formations, a study of the water-bearing capacity of each formation outcropping at the surface or encountered by wells, the determination of the depth and yield of the waters, the study of the mineral springs, and the investigation of the public water supplies. Records of deep wells were procured, drillers were interviewed as to methods employed and general water conditions, and statistics were gathered in regard to the shallow wells in rock or unconsolidated material. The chemical work included field examinations of waters from each of the several classes of drift and rock formations and determinations of the carbonates, sulphates, chlorids, and iron. Complete analyses of samples of about 35 waters were made at the Washington laboratory, and analyses were obtained from owners of many wells. In the study of public supplies special attention was given to the sanitary quality of the water, with a view to determining sources of pollution and to making recommendations as to their removal."

The district studied included "the following counties: Adams (western half), Brown, Butler, Clark, Clermont, Clinton, Darke (southern part), Greene, Hamilton, Highland (western half), Miami (southern part), Montgomery, Preble, Warren. The principal cities are Cincinnati, Dayton, Hamilton, and Springfield." This district "receives abundant rainfall, the precipitation averaging over 40 in. a year. The streams, however, are rather far apart and springs are few and of small volume. Moreover, as the region is densely populated, the inhabitants averaging about 150 to the square mile in the area as a whole and 50 in the rural districts, and as it contains many paper mills, distilleries, powder mills, and other manufacturing establishments, the surface waters are in many localities badly polluted by sewage and industrial wastes and are entirely unfit for drinking."

The greater part of the usable water of the region "occurs either in the drift and alluvium or in the 'Niagara' and 'Clinton' limestones, both of which are at or near the surface in this area and are easily reached in shallow wells. Rock wells that go below the level of the 'Clinton' limestone have rather small chances of success, although a few obtain satisfactory supplies; the majority either fail entirely or get supplies too small for ordinary uses. Deep wells give no promise, for though in most places they can obtain water, it will generally be either salty or highly charged with sulphur."

A bibliography of the more important publications relating to underground waters of Ohio is given.

Gazetteer of surface waters in the Pacific coast drainage basins and the Great Basin, California, B. D. WOOD (*U. S. Geol. Survey, Water-Supply Paper 297, pp. 244*).—This is the third of this series of reports on the surface waters of California prepared by the U. S. Geological Survey under cooperation with the State Conservation Commission of California (E. S. R., 28, pp. 117, 317). It describes the streams and lists the gaging stations in the area named.

Water resources of California. III, Stream measurements in the Great Basin and Pacific coast river basins, H. D. McGlashan and H. J. Dean (*U. S. Geol. Survey, Water-Supply Paper 300, pp. 956, pls. 4*).—This is the sixth of a series of reports "on the surface waters of California prepared by the United States Geological Survey under cooperative agreement with the State Water Commission and the State Conservation Commission. This paper describes the streams that have been measured in the Great Basin and Pacific coast river basins and the stations at which the work has been carried on and gives tables covering all the measurements and estimates made by the Geological Survey in these basins. The investigations of the flow of water in the streams have been supplemented by studies of the climatic and other factors affecting stream flow, so that these reports afford valuable data for all phases of hydraulic work."

Surface water supply of the Great Basin, 1911, F. F. Henshaw, H. D. McGlashan, and E. A. Porter (*U. S. Geol. Survey, Water-Supply Paper 310, pp. 210, pls. 4*).—The drainage of this basin is described and stream measurements in it are reported in detail.

Composition of some New Mexico waters, R. F. Hare and S. R. Mitchell (*New Mexico Sta. Bul. 83, pp. 76*).—This bulletin reports in part analyses of surface and underground waters of New Mexico examined by the station during the past years in continuation of earlier work (also E. S. R., 5, p. 1002; 12, p. 834), and discusses their fitness for irrigation and domestic purposes. The bulletin does not include analyses of waters of the Tularosa basin, which were made in cooperation with the U. S. Geological Survey and are to be published separately.

"Black alkali has not been found in any of the streams, and in very few of the underground waters in that part of the State east of and including the Rio Grande. Nearly all the waters, on the contrary, contain gypsum, which serves as an antidote for this injurious substance. . . . 'White alkali' is present in all the waters of this section, the amount depending upon the character of country through which the water passes. In certain inland basins, where drainage has not removed the soluble salts, white alkali is present in such large quantities as to render the water unfit for irrigating purposes. . . .

"The limited number of analyses of waters in the northwestern part of the State, west of the Rio Grande, show considerable white alkali in certain sections, especially in some underground waters of San Juan County. Some black alkali was found, but its presence seems likely to be restricted to limited areas. Those waters of the southwestern part of the State west of the Rio Grande are quite different in composition from those east of this river. No gypsum is found in the waters of this locality, but carbonate of soda (black alkali) is often present. This property makes these waters very desirable for some purposes. They are well suited for domestic use, since all their hardness is temporary, which can be completely removed by boiling. Where the carbonate of soda is not present in too large amount, they are well suited for irrigation and boiler use.

"The abundance of rain and snow with good drainage in the mountainous section often prevents the accumulation of this alkali in quantities injurious to crops, but as the streams flow from the mountains out into the plains we often find black alkali accumulated in dangerous quantities in the waters and soils."

Bacterial analysis of city water supplies, L. L. Lewis and B. J. Clawson (*Oklahoma Sta. Rpt. 1912, pp. 10–16*).—Bacteriological examinations of two samples of water from small reservoirs, a large number from shallow wells, one

from a flowing muddy stream, and one of water from a well in the valley of the Arkansas River are reported and discussed with reference to their suitability for drinking purposes and the efficiency of methods of purification in use. The results indicate a high degree of contamination (over 50 per cent) in the waters of shallow wells and varying efficiency in the methods of purification employed, namely, treatment with lime, iron sulphate, and hypochlorite of lime.

Disposal of sewage with recovery of elements of plant food for use in agriculture, W. McMURTRIE (*Jour. Indus. and Engin. Chem., 5 (1913), No. 2, pp. 156–159*).—The method recommended is precipitation with monocalcium phosphate and lime in a Dortmund tank.

The sanitation of the Seine and the sewage farms of Paris, P. VINCEY (*Mem. Soc. Nat. Agr. France, 143 (1912), pp. 119–254, figs. 25*).—This is one of a series of reports on this subject (E. S. R., 17, p. 845), and presents an elaborate study of the nature and extent of pollution of the Seine by sewage from different sources in the city of Paris, and of the rational management of the municipal sewage farms with a view to increasing the capacity of these farms and thus reducing the pollution of the river. The total area of the sewage farms (in four different tracts) is in round numbers 11,115 acres, of which about 7,410 acres is actually under crops, the latter including various kinds of garden crops, forage plants, cereals, and trees and shrubs.

In 1909, 23,368,600 cu. ft. of sewage was disposed of daily on these farms. The author believes sewage irrigation more efficient than intensive artificial filtration for purification of sewage, and he describes various ways in which the efficiency of the sewage farms may be increased, including elimination of cereals, decrease of garden crops, and increase of grasses and forage plants, and generally those methods of management calculated to secure greater and more uniform use of the sewage. With the possible increase in efficiency the farms are considered capable for a number of years to come of purifying the sewage of Paris in conformity with all essential requirements of the law.

Disposal of sewage in Europe, J. L. GRIFFITHS ET AL. (*Daily Cons. and Trade Rpts. [U. S.,], 16 (1913), No. 61, pp. 1281–1291*).—This article describes a process of destructive distillation of sludge which yields ammonia as one of its principal products as well as a spent residue containing lime and some phosphate. It also refers to the installation at Oldham, England, of the Grossmann process for the extraction of grease and the preparation of a sterilized fertilizer from sludge; the method of extracting grease and preparing fertilizer from sludge at Bradford and Huddersfield; and to the utilization of sludge for the manufacture of fertilizer at Glasgow, Dublin, and Kingston-on-Thames. The use of sewage or sewage sludge for fertilizer by the cities of Prague, Austria; Hamburg and Dresden, Germany; and Havre, France, is also described.

SOILS—FERTILIZERS.

The origin of soils, D. LIENAU (*Die Entstehung der Ackerböden. Halle, 1912, pp. IX+223, table 1, pls. 3, figs. 5*).—This book discusses in a more or less popular way rocks, soils, and life; origin and properties of soil-forming rocks; geological history of Saxony, Anhalt, and Thuringia; soil formation; and soil mapping and its importance to farmers. The author's experience in lecturing to farmers in the Province of Saxony indicated that a discussion of this subject, largely from the geological standpoint, would be of interest and value to them.

Geologic-agronomical maps and their importance for agriculture and forestry, W. SCHOTTLER ET AL. (*Notizbl. Ver. Erdk. Darmstadt, 4. ser., 1911, No.*

32, pp. 14 58).—This is a review with bibliography of the present status of geologic-agronomic soil mapping in Germany. The practical application of these maps is discussed.

Mechanical soil analysis and classification of Swedish mineral soils, A. ATTERBERG (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 6, pp. 438–463, fig. 1; Internat. Mitt. Bodenk., 2 (1912), No. 4, pp. 312–342, fig. 1*).—The author gives a report on further studies of his method of mechanical soil analysis (E. S. R., 21, p. 106) and also of Beam's method (E. S. R., 26, p. 719). The system of classification elaborated by him on the basis of examinations of 86 typical Swedish soils is explained and discussed. These soils are included in 11 classes, with 29 subclasses. The system allows of the formaton of additional subclasses.

The composition of soils, C. K. FRANCIS (*Okla. Farmer, 22 (1913), No. 17, pp. 3, 11, fig. 1*).—This is a brief discussion of the subject based upon analyses of certain representative Oklahoma soils.

Chemical studies of Virginia soils, W. B. ELLETT and H. H. HILL (*Virginia Sta. Bul. 200, pp. 24, figs. 2*).—Analyses and fertilizer tests of the more important soil types of the Coastal Plain, Piedmont Plateau, and Appalachian regions of Virginia are reported.

The results in general showed that the soils were markedly deficient in available phosphoric acid. Nitrogen was deficient in soils where the humus supply had been exhausted. The available potash was abundant. "An occasional liming is beneficial and profitable on some of the soils of the Coastal Plain, on a large part of the soils of the Piedmont Plateau, and on occasional soils of Appalachia."

Reconnoissance soil survey of Marinette County, S. WEIDMAN and P. O. WOOD (*Wis. Geol. and Nat. Hist. Survey Bul. 24, 1911, pp. 44, pls. 5, fig. 1*).—This report, which was prepared in cooperation with the Bureau of Soils of this Department, gives a classification and description, including map, of the soils of this county of Wisconsin.

The soils are predominantly sandy and are formed mainly from glacial and alluvial deposits derived from limestone, sandstone, and granite. In the northern and northwestern part of the county are belts of terminal moraines.

The soils in general are well supplied with potash and deficient in phosphoric acid, nitrogen, and lime. Many of the soils, especially the sandy types, appear to be acid.

On the composition of the sandy soils of Tripoli, A. MENOZZI (*R. Ist. Lombardo Sci. e Let. Rend., 2. ser., 45 (1912), No. 7, pp. 322–330*).—A further account of investigations already noted from another source (E. S. R., 27, p. 217).

A contribution to the study of the saline soils of the Mediterranean coast, H. LAGATU and L. SICARD (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr. [France], 1909, No. 40, pp. 141–193, pls. 19, figs. 2*).—Studies of the physical, chemical, and mineralogical composition, the humidity, and the chlorin content of the soils of the swampy region along the coast of Hérault, France, are reported in detail.

The soils in general are defined as very plastic, calcareous clays, poor in organic matter. They are not acid and are generally rich in nitrogen, potassium, magnesium, and iron, comparatively rich in phosphoric acid, and very rich in lime. The chlorin content of the soils varied but was considerable. It is believed that the soils have an important agricultural value and that they can be readily reclaimed by adequate drainage systems.

Soils of the Stanthorpe district, J. C. BRÜNNICH and G. R. PATTEN (*Queensland Agr. Jour., 29 (1912), No. 6, pp. 499–502, pl. 1*).—Mechanical and chemical

analyses of a number of samples of granitic soils from different sections of the Stanthorpe district of southern Queensland are reported and discussed.

The soils on the whole are easy to work, well drained, and retain moisture very well. The large crop-producing power of the soil is attributed to the favorable physical condition. The chemical analyses showed the soils to be rather deficient in available plant food, humus, nitrogen, and lime being especially low. The soils contain as a rule a large amount of potash (as high as 5 per cent), but little of this is in soluble or available form.

Soils of Cowra and Wagga Experiment Farms and of the southwestern slopes, H. I. JENSEN (*Dept. Agr. N. S. Wales, Sci. Bul. 8, 1912, pp. 14, pls. 2*).—Studies of the physical and chemical properties of the soils of these experimental farms and of the southwestern slopes of New South Wales are reported.

The soils of the farms are fairly well supplied with plant food "and need no manure except organic matter and perhaps for cereal crops a little superphosphate." The soils of the southern slope are of granite and schist formation. Both types are deficient in humus. "The granite soils are well supplied, and the slate soils badly supplied, with potash. Phosphoric acid in the acid-soluble condition varies almost directly with the volatile content. Hence, to prevent the superphosphate added in wheat culture from immediately reverting to the insoluble condition, endeavors should be made to increase the humus."

Deli soils, J. G. C. VRIENS and S. TIJMSTRA (*Meded. Deli-Proefstat. Medan, 5 (1911), No. 9, pp. 297–325, pl. 1; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 26, pp. 811, 812*).—This is a continuation and conclusion of the report on investigations of the Deli soils of the east coast region of Sumatra, some of the more important results of which have already been noted (E. S. R., 25, p. 321).

The results of chemical and physical studies of 586 samples of these soils, classified as sand, clay, loam, and humus soils, are summarized. In the clay soils (over 70 per cent clay) nitrogen varied from 0.10 to 0.25 per cent, averaging 0.17; potash from 0.05 to 0.27 per cent, averaging 0.16; the absorption coefficient from 80 to 123, averaging 100; and the water capacity from 39 to 50 per cent, averaging 45 per cent. In the sandy soils (less than 10 per cent clay) nitrogen varied from 0.09 to 0.79 per cent, average 0.34; potash from 0.04 to 0.28 per cent, averaging 0.10; absorption coefficient from 33 to 96, averaging 70; and the water capacity from 34 to 54 per cent, averaging 45 per cent.

The authors bring out by means of algebraic formulas certain natural relationships which seem to exist between various chemical and physical properties of the soils, using for this purpose 13 properties, divided into 3 classes, and making in all nearly 2,000,000 possible combinations. A number of cases of parallelism between calculated and observed results are noted.

Deli soils, J. G. C. VRIENS and S. TIJMSTRA (*Internat. Mitt. Bodenk., 2 (1912), Nos. 1, pp. 53–80, pls. 2, figs. 2; 2–3 pp. 258–272; 5, pp. 437–469*).—This article deals with investigations which are also reported in the article noted above.

[Analyses of Tasmania soils], H. J. COLBOURN (*Agr. and Stock Dept. Tasmania, Bul. 33, 1912, pp. 18–23*).—Physical and chemical analyses of typical fruit soils of the Huon and Channel districts and of the Tamar Valley, Tasmania, are reported and discussed. The soils are of two distinct types, "the alluvial soils from near the river and a poorer class of upland soil, probably disintegrated mudstone."

The alluvial soils contained a good percentage of lime; a fair amount of phosphoric acid in the surface, but considerably less in the subsoil; and an abundant supply of nitrogen. The soils were low in potash.

The upland soils were very poor in phosphoric acid and lime. They contained a fair amount of potash and were well supplied with nitrogen.

The soils from the Tamar Valley districts varied considerably in chemical composition, being deficient in all cases in one or more of the plant-food constituents.

Influence of the composition of rocks on the fertilizer constituents of cultivated soil, L. ROUGIER and C. PERRET (*Vie Agr. et Rurale, 1912, No. 52, pp. 697–700, figs. 3*).—The authors discuss the mineral composition of different rocks in relation to the plant-food constituents (nitrogen, phosphoric acid, potash, and lime) of the resultant soils, particularly certain granitic soils of the Department of Loire, France, a large number of analyses of which have been made from time to time (E. S. R., 22, p. 320).

It is shown that soils derived from the decomposition of rocks in place contain larger amounts of plant food than sedimentary soils, but that on account of the larger proportion of fine particles giving a better physical structure of the soil and a greater assimilability of the plant food, sedimentary soils are often of more value for agricultural purposes. However, not all soils formed from the decomposition of rocks in place are poor in available plant food, notable exceptions being granitic and volcanic soils.

Temperatures in various kinds of soil surfaces, P. VUJEVIĆ (*Met. Ztschr., 29 (1912), No. 12, pp. 570–576, fig. 1*).—Temperature observations on small surfaces covered with sand, limestone, humus soil, and grass are reviewed.

The sand showed a uniformly higher temperature than the humus soil or the grass-covered surface, but the amplitude of variation was greatest in the sand surface. In the grass-covered surface the temperature was modified to a marked extent by moisture conditions (condensation and evaporation). The absolute temperatures were lower, the amplitude was smaller, and the rise of temperature (seasonal and daily) slower on the grass-covered surface.

Regarding the drying of the soil, H. FISCHER (*Centbl. Bakt. [etc.], 2. Abt., 36 (1912), No. 6–14, pp. 346–349*).—This is a review of the work of Rahn (E. S. R., 20, p. 120) and of Ritter (E. S. R., 27, p. 121), showing increased bacterial activity in dried soils. The author suggests that this is due to the increase by oxidation of readily available food for bacteria in the dried soils.

Capillarity and agrology, H. PUTTEMANS (*Ann. Gembloux, 22 (1912), Nos 11, pp. 636–645, figs. 5; 12, pp. 665–683*).—The author discusses the movement of capillary water in the soil and emphasizes particularly the significance of capillary water in crop production, especially as applied to cultural methods under dry-farming conditions.

Tests of capillarity, water-holding power, and evaporation, D. CASIMIRO BRUGUÉS Y ESCUDER (*Mem. R. Acad. Cien. y Artes Barcelona, 3. ser., 10 (1912), No. 10, pp. 17*).—Tests with mixtures containing varying proportions of sand, clay, and calcium carbonate are reported.

Improvement of the soil, H. KNAUER (*Meliorationen (Bodenverbesserungen). Strelitz, 1912, pp. VI+183, pls. 2, figs. 167*).—This is a general treatise on the improvement of agricultural lands, and deals at length with the subject under the following general headings: The principal kinds of soil, and the most important vegetation; the influence of climate, and character and condition of the soil; drainage of swamp and cultivated lands; and irrigation of arid and semi-arid lands. The principal means of improvement discussed are cultivation of the soil; the regulation of small streams; the establishment of water storage reservoirs and like works; the building of dikes, dams, and water distribution systems; drainage and irrigation of cultivated lands, the use of pumping machinery and wind power for both drainage and irrigation; the conservative use

of water; the utilization of city garbage and sewage; encouragement of the fish industry; and the building of roads, canals, and bridges.

The sterilization of the soil, E. MIÈGE (*Rev. Sci. [Paris], 50 (1912), II, No. 13, pp. 396–399*).—This is a brief review of investigations on this subject.

Influence of an addition of sugar on the productivity of a soil, T. PFEIFFER and E. BLANCK (*Landw. Vers. Stat., 78 (1912), No. 5–6, pp. 375–388; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 604, I, p. 240*).—Continuing previous investigations (E. S. R., 27, p. 722), the authors studied the influence of sugar in combination with phosphatic fertilizers on the yield and nitrogen content of oats and turnips. The results in general confirm those of the previous experiments, and show that additions of sugar to the soil did not promote the activity of nitrogen-collecting bacteria to a sufficient extent to produce an appreciable increase in the yield of crops.

The action of fat solvents upon sewage-sick soils, R. GREIG-SMITH (*Proc. Linn. Soc. N. S. Wales, 37 (1912), pt. 2, pp. 238–243*).—In continuation of previous investigations (E. S. R., 27, p. 621), the author studied the chloroform, alcohol, and water extracts of a sewage-sick soil with reference to Russell and Golding's theory (E. S. R., 25, p. 515) that sewage sickness is due to the presence of excessive numbers of protozoa which are destroyed by partial sterilization. The author concludes "that the action of the volatile disinfectants upon the sewage-sick soils is not, as Russell and Golding affirm, to destroy the phagocytic protozoa, so much as to bring about a segregation of the agricere in which such soils are specially rich."

Chlorosis in orchards near Bloemfontein, C. F. JURITZ (*Agr. Jour. Union So. Africa, 4 (1912), No. 6, pp. 854–865; 5 (1913), No. 1, pp. 102–112*).—Analyses of the soils on which chlorosis occurred indicated that the trouble could not be due to lack of plant food, it being, in fact, worse where plant food was most abundant, nor to lack of iron, excess of magnesia, or presence of parasitic fungi. There was, however, an excessive amount of calcium carbonate in the soils. Analyses of a number of samples of alkali occurring in certain of the soils are reported, but no direct relation between alkali and chlorosis was established. The conditions favoring chlorosis were apparently intensified by unsatisfactory moisture conditions in the soil and by the existence of a fairly impermeable substratum of marl.

Plant growth and lack of lime in the soil, A. WIELER (*Pflanzenwachstum und Kalkmangel im Boden. Berlin, 1912, pp. VII+235, figs. 43; rev. in Umschau, 16 (1912), No. 49, pp. 1034–1037, figs. 3*).—This book contains reports on investigations on (1) the removal of lime from soils by furnace fumes, and (2) the poisonous action of metallic compounds on plant growth.

Investigations made in treeless areas in the vicinity of smelters in the Harz Mountains showed that the lime had been removed to such an extent that the growth of trees was impossible. The author concludes that this is largely due to the solvent action of sulphurous fumes from the smelters. When the soil was limed trees grew well. Some injury was doubtless due to the direct corrosive action of the acid fumes, trees being less resistant in this respect than meadows, field crops, and vegetables. Potatoes were found to be especially resistant, other vegetables in varying degrees.

Pot and field experiments with various crops on soils of different kinds to which varying amounts of metallic substances which may occur in smelter fumes, such as lead, zinc, and copper, and certain of their compounds, were added, gave inconclusive results, the effect being beneficial in some cases, injurious in others.

The effect of liming on the crop production, C. A. MOOERS (*Tennessee Sta. Bul. 96, pp. 15–23*).—In the experiments described in a previous bulletin (E. S. R., 26, p. 426) each series of plats was treated at the beginning with recently slaked lime at the rate of about 1 ton per acre. The results showed as a rule a profitable increase in yield of both wheat and cowpeas as a result of liming on loams varying in stiffness and fertility. "The yields both of cowpea hay and of wheat were not increased by liming where light annual applications of manure (4 tons per acre) were made; also it did not increase the growth of cowpeas on the plat where only cowpeas were grown each year and turned under." Liming was most profitable on the acid phosphate plats. With heavy applications of Thomas slag the value of liming was questionable, and it was of little value on plats receiving rock phosphate. "The increased yields obtained from liming are attributed to an increase in available nitrogen, which was utilized by both the cowpeas and the wheat."

The effect of liming and of green manuring on the soil content of nitrogen and humus, C. A. MOOERS, H. H. HAMPTON, and W. K. HUNTER (*Tennessee Sta. Bul. 96, pp. 25–43, figs. 3*).—Studies of one of the soils (that of the station farm) used in experiments referred to above, showed that "land in sod for a number of years suffered in five years, under cultivation in a double-crop rotation of cowpeas and wheat, a serious loss of nitrogen. Loss took place under all of the experimental conditions, including the turning under annually of a cowpea crop, which amounted to more than a ton of hay per acre, not including the fallen leaves, stubble, and roots.

"The loss of nitrogen was appreciably greater on the limed than on the unlimed areas, and extended below the depth of plowing. The average annual loss of nitrogen directly attributable to liming was calculated to be 0.83 per cent of the total soil content for the first two years and 0.52 per cent for the last three years. A slightly greater loss of nitrogen took place from the acid phosphate plats than from the no phosphate and phosphate rock plats.

"By taking the nitrogen removed by the crops into consideration, there was found to be, at the end of five years, (1) where the cowpea crop was turned under, a gain per acre on the unlimed sections of 67 lbs., to be accounted for in sources outside of the 8-in. depth of plowing, but on the limed sections none; (2) where the cowpea crop was removed, a gain per acre of 181 lbs. on the unlimed and 177 lbs. on the limed, to be accounted for as before.

"Where the cowpea crop was turned under each year for five years there was found at the end of that time, on the unlimed sections, an increase of 3.79 per cent of humus as the average of 12 plats, but neither gain nor loss on the corresponding limed sections. Where the cowpea crop was removed for the five years there was an apparent gain of 2.38 per cent on the unlimed sections as the average of 4 plats, but an apparent loss of 3.17 per cent on the corresponding limed sections."

Effect of long-continued one-sided fertilizing on plants and soils, S. GRAF ROSTWOROWSKI (*Jour. Landw., 60 (1912), No. 4, pp. 371–392; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 604, I, p. 236; Ztschr. Angew. Chem., 26 (1913), No. 24, Referatenteil, p. 196*).—Ash analyses of diseased (rolled leaves of potatoes grown on soils which had been fertilized since 1873 with a fertilizer lacking potash showed that the ash was deficient in potash but whether as cause or effect of the diseased condition was not determined. More detailed ash analyses of potato plants and tubers grown with incomplete fertilizers showed that the composition of the ash of the plants fertilized with potash alone and with a complete fertilizer was almost identical. The same was true of ash of unfertilized potatoes and potatoes fertilized with nitrogen. There was a wide varia-

tion in the potash content of plants grown with and without potash. There was a high soda content in potatoes fertilized with sodium nitrate, indicating replacement of potash by soda. High potash was accompanied by low phosphoric acid, the latter apparently running parallel with lime and magnesia in the plant ash.

Samples of soil from the differently fertilized plats were extracted with water and then tested as to their absorptive power with ammonium chlorid solution, but with generally inconclusive results, although there appeared to be some replacement of absorptive lime compounds by potash in the soils rich in potash. The application of lime in the form of superphosphate apparently had no effect upon the lime-potash ratio in the plant ash.

Getting the most profit from farm manure, E. B. HART (*Wisconsin Sta. Bul. 221, pp. 34, figs. 10*).—This bulletin discusses the value of manure produced in Wisconsin, the annual loss due to careless management of the manure, the percentage of fertility in feed recoverable in manure, the principal causes of loss in the handling of manure and the best means of reducing such losses, and the combined use of commercial fertilizers and manure.

Fish-scrap fertilizer in the United States (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 31, pp. 657–661; Amer. Fert., 38 (1913), No. 4, pp. 27–29*).—This industry has reached its largest proportions on the Atlantic and Gulf coasts, where the fertilizer is made mainly from menhaden fish, the annual production being from 60,000 to 70,000 tons of fish scrap and about 35,000 bbls. of oil. The scrap and offal from other fish are used to a limited extent only, the fish being usually cleaned on the fishing boats and the offal thrown into the sea.

There are now about 30 factories and 70 steamers engaged in the business, which centers largely around Chesapeake Bay (15 or 16 factories), and Beaufort, N. C. (8 to 10 factories). There are also factories in New Jersey, Massachusetts, Florida, and other States. A floating plant, capable of reducing 10,000 bbls. of fish into 800 bbls. of oil and 20 tons of dried fish scrap daily, was established in 1911.

There are three fish rendering establishments in Canada, one in New Brunswick, and two in Nova Scotia, which were built primarily for the purpose of utilizing the dogfish.

Until recent years fish scrap was little used on the Pacific coast. It is reported that there were five companies on Puget Sound and one at Astoria engaged in the manufacture of fish fertilizer in 1911. These, with the Alaskan factories, produced 5,890,000 lbs. of fertilizer and 534,250 gals. of oil, the greater portion of this output, however, coming from the Alaskan herring factories. There were four factories in Alaska engaged in the production of fish oil and fertilizer in 1911, the total product being 3,520,000 lbs. of herring fertilizer and 343,000 gals. of oil. The Alaskan product is disposed of almost exclusively in Hawaii, there being little demand for fertilizers on the Pacific coast and high freight rates prohibiting its shipment at a profit to the eastern United States.

A considerable amount of fish fertilizer is imported from Europe, principally from Norway. The report emphasizes the great waste of fisheries' by-products which might be profitably utilized as fertilizer.

History of the nitrate industry in the eighteenth century, P. MARTELL (*Chem. Indus. [Berlin], 36 (1913), No. 2, pp. 38–42*).—This is a brief historical review of the industry in Germany.

General statistics of nitrate of soda, MAIZIÈRES (*Engrais, 28 (1913), No. 2, pp. 42, 43*).—Statistics of the world's production and consumption of nitrate of

soda for a series of years are given. It is stated that the consumption in 1912 was 2,753,300 tons as compared with 2,582,800 tons in 1911.

[Chilean production of nitrate], A. A. WINSLOW (*Commercial Fert., 5 (1912), No. 4, p. 21*).—It is stated that the production during the year ended June 30, 1912, was 2,469,000 tons against 2,459,000 tons the previous year. The consumption is stated to have been 2,460,000 and 2,324,000 tons, respectively, and that in the United States 503,000 and 535,000 tons, respectively.

Nitrate position and results (*Economist, 76 (1913), No. 3620, pp. 63–65*).—Statistics of the Chilean nitrate industry are reviewed and it is shown that the year 1912 was a prosperous one, prices ruling higher than in 1911 notwithstanding increased production. There was a steady growth in demand although consumption fell off in the United States.

Crude ammonia, M. CHASSAING (*Bul. Agr. Algérie et Tunisie, 18 (1912), No. 22, pp. 509–516*).—This article discusses briefly the source, composition, value as a fertilizer and insecticide, method of using, and purchase of crude ammonia.

Lime nitrogen as a top-dressing for rye in spring, CLAUSEN (*Deut. Landw. Presse, 39 (1912), No. 103, pp. 1204, 1205, figs. 2*).—The field experiments with lime nitrogen, ammonium sulphate, and sodium nitrate here reported indicate that lime nitrogen is an effective spring top-dressing for rye when applied about the beginning of March or the end of February.

Phosphates in Idaho and Montana, A. R. SCHULTZ, R. W. RICHARDS, and J. T. PARDEE (*U. S. Geol. Survey Bul. 530–H, pp. 27, pl. 1, figs. 6*).—As a result of the geological reconnoissance of southeastern Idaho reported in this bulletin, 249,047 acres of phosphate land in that region has been restored to agricultural entry and the former boundaries of phosphate reserves have been modified and extended. As a result of a similar reconnoissance in Montana deposits of commercially valuable phosphate rock have been discovered in 4 localities, namely, (1) in the Garnet Range, 6 miles north of Garrison; (2) at Philipsburg, on the south slope of Flagstaff Hill; (3) half a mile east of Elliston, north of Little Blackfoot River; and (4) about 2 miles east of Cardwell (formerly known as Jefferson Island).

The consumption of potash, MAIZIÈRES (*Engrais, 28 (1913), No. 3, pp. 70, 71*).—The consumption of potash is given in detail for different provinces of France from 1900 to 1911 and in gross for other countries of the world for 1911.

The total consumption for the whole world in 1911 is stated to have been 830,444 tons of pure potash (K_2O). Of this Germany consumed 464,590 tons and the United States 158,437 tons. The largest consumers of pure potash per unit area were Holland, about 15 lbs. per acre, and Germany, about 10.7 lbs. per acre of cultivated area. The United States consumed only about 0.76 lb. per acre.

The cost of agricultural lime in Connecticut, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Bul. 175, pp. 3–8*).—"The object of this bulletin is to answer the questions which are constantly asked [the station] during the late winter and spring about the quality and price of agricultural lime and where to get it." It reports and discusses analyses and valuations of samples of lime, limestone, ground oyster shells, and limekiln ashes collected in the State.

Agrological study of manganese, P. NOTTIN (*Ann. Sci. Agron., 4. ser., 2 (1913), I, No. 1, pp. 1–12*).—This is a detailed account of investigations more briefly noted elsewhere (E. S. R., 28, p. 30).

Fertilizers and Paris green, J. E. HALLIGAN ET AL. (*Louisiana Stas. Fert Rpt. 1911–12, pp. 3–96*).—This is a report on the inspection of fertilizers a Paris green in Louisiana during the year 1911–12, including analyses and va

ations of about 7,000 samples of mixed fertilizers and fertilizing materials, such as acid phosphate, bone meal, tankage, cotton-seed meal, and fertilizer chemicals. The mixed fertilizers were more frequently deficient in nitrogen than in phosphoric acid or potash. In the 178 samples of Paris green examined arsenious oxid varied from 46.57 to 57.48 per cent, averaging 54.31 per cent.

Inspection of commercial fertilizers, 1912, H. D. HASKINS ET AL. (*Massachusetts Sta. Bul. 143, pp. 93*).—This bulletin reports in detail analyses and valuations of fertilizers inspected during the year, with various explanatory notes regarding the results of inspection and quality of the fertliizers examined. The quality of plant food furnished by the mixed fertilizers is discussed and emphasis is laid upon the economy of purchasing only high-grade fertilizers.

Analyses of fertilizers and cotton-seed meal, fall season, 1911, and spring season, 1912, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 33 (1912), No. 8, pp. 178*).—This bulletin contains analyses of fertilizers and cotton-seed meal collected by the fertilizer inspectors of the state department of agriculture during the fall of 1911 and spring of 1912, as well as a list of brands of fertilizers registered for sale in 1912.

AGRICULTURAL BOTANY.

Bacteria at different depths in some typical Iowa soils, P. E. BROWN (*Iowa Sta. Research Bul. 8, pp. 282–321, pls. 9*).—A comparison was made of the number of organisms as determined by depth, moisture conditions, humus content, and nitrogen content of 8 plats located on the Wisconsin drift area, under different conditions of cropping and rotation. The principal conclusions of the author are the following:

In the different soil types as well as in the same soil under different rotations the greatest number of organisms occurred at a depth of 4 in. Bacteria were found in considerable numbers at much lower depths in loess soil than in drift soil. A more or less gradual decrease in the number of bacteria occurred at depths of 3, 5, and in one case 15 ft., the greatest decrease occurring usually within the first 12 in., but in some cases within the first 8 in. The rotation of crops increased the number of organisms, and at 4 in. from the surface the soil under the 3-year rotation showed a larger number of organisms than that under a 2-year rotation. At 8 in. fewer organisms were found under the 3-year rotation than in soils under the 2-year rotation with clover or cowpeas. Rye in the 2-year rotation decreased the number of bacteria. Fewer bacteria were found in soil under continuous clover than in soil under continuous corn, and this is attributed to the difference in treatment of the crops. The soil under the 4-year rotation showed smaller numbers of bacteria than in any of the plats except those continuously under clover and corn and in the 2-year rotation where rye was turned under.

The humus content of soils in practically all the plats and the nitrogen content of all the soils decreased more or less regularly down to 3 ft. In some cases there appeared to be a relation between the number of organisms and the humus or nitrogen content of the soil, but the variations observed in the nitrogen content were insufficient to account for the differences in numbers of the organisms.

It is believed that aeration may be the governing factor, or that possibly the toxic substances produced by the growth of plants may cause variation in the bacterial content of the different plats.

The destruction of cellulose by bacteria and filamentous fungi, I. G. McBETH and F. M. SCALES (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 266, pp. 52,*

pls. 4).—On account of the importance of the action of micro-organisms on the breaking down of cellulose in soils, manures, etc., the authors made a study of some of the forms, and isolated 15 species of cellulose-destroying bacteria, several of which have not been described hitherto, and 16 species of fungi which have more or less power to dissolve cellulose.

Cellulose-destroying bacteria and molds are held to be universally present in cultivated soils. The bacteria are facultative in nature, but destroy cellulose most rapidly in the presence of air. The cellulose-dissolving bacteria isolated by the authors are said to be morphologically and physiologically different from the hydrogen and methan ferments of Omelianski. Some of the cellulose-destroying bacteria were found to lose their destructive power very rapidly when grown in artificial media. The filamentous fungi are said to play a much more important rôle in the destruction of cellulose in soils, especially in alkaline soils, than has been hitherto supposed. The cellulose-destroying molds act very differently toward different kinds of cellulose. The gaseous products attributed to cellulose ferments by earlier investigators are held to be due to secondary fermentations induced by other organisms. The principal products formed by cellulose-dissolving bacteria are said to consist of the lower fatty acids in some species, while with others only traces of fatty acids are formed. No aldehydes, ketones, alcohols, or reducing sugars were found to be produced by any of the species examined.

The following new species are technically described: *Bacterium fimi*, *B. liquatum*, *Bacillus bibulus*, *B. cytascus*, and *Pseudomonas subcretus*.

The bulletin concludes with a bibliography of the subject.

The fixation of nitrogen by free-living soil bacteria, W. B. Bottomley (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 607, 608*).—Continuing previous work (E. S. R., 27, p. 729), the author reports experiments with Azotobacter and Pseudomonas, separately and together, using glucose as carbohydrate. Thirty-eight separate nitrogen determinations were made and in every series mixed cultures gave a greater increase of nitrogen fixation per unit of carbohydrate than when the organisms were grown separately; also the mixed cultures used up the carbohydrate more rapidly than did the pure organisms. The averages of nitrogen given in 10 days per gram of glucose used were for the control 0.47 gm., for Pseudomonas 2.48 gm., for Azotobacter 3.21 gm.; for both together 4.76 gm. of nitrogen in 8½ days. This sustained the findings of the previous investigation.

Some effects of bacteriotoxins on soil organisms, W. B. Bottomley (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, p. 608*).—The author found that if a well rotted manure or a fertile soil was treated with a 0.9 per cent salt solution (100 gm. of manure to 500 cc. of solution), the liquid extracted by means of a Pukall filter had a marked effect on the growth of pure cultures of soil organisms. Denitrifying bacteria throve well in such an extract. The growth of the nitrogen fixers Azotobacter and Pseudomonas was inhibited, but boiling the extract for an hour destroyed the toxic effect of the extract. Tabulated data regarding the experiments are given. The observed effects, it is suggested, may have some significance as regards the beneficial results of heating soils.

The physiology of Phoma betæ, W. Fischer (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1912), No. 2, pp. 85–108, figs. 2*).—The author found that fructification in *P. betæ* shows an optimum temperature of about 29°, with the minimum between 7 and 10°, and the maximum above 33° C. The spores bear a temperature of 52° C. from 50 to 60 minutes, but are killed by boiling water in 10 minutes.

In the growth of the fungus grape sugar is an excellent source of carbon, but cane sugar, levulose, and glycerin are of very limited value in this respect. In the presence of other carbon sources asparagin and all organic acids so far as studied exert a limiting effect on growth. The fungus thrives best on a nitrogen-free substratum. The addition of nitrogen is harmful, nitrate being least so, then peptone, asparagin, and ammonium salts. *P. betæ* produces invertase, which quickly and completely inverts cane sugar.

The action of substances readily soluble in water, but not soluble in oil, on the growth of Penicillium glaucum, J. Böeseken and H. Waterman (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 14 (1912), pt. 2, pp. 1112–1117*).—Regarding their investigations on the retarding influence of certain substances on the growth of fungi, the authors give the following summary:

"It has been shown that the retarding action of some acids soluble in oil must be attributed to the hydrogen ions. The harmful concentration of the hydrogen ions for the *P. glaucum* was determined at 0.00001 gm. equivalent (for the *Aspergillus niger* at 0.000045 gm. equivalent).

"It has been assumed that this injurious action was caused by a coagulation of the colloidal constituents of the plasm. In connection with researches of other investigators, it was surmised that the coagulation was attended by a neutralization of the colloids having a negative charge by the hydrogen ions with a positive charge."

Transpiration of wheat seedlings as affected by different densities of a complete nutrient solution in water, sand, and soil cultures, G. Bouyoucos (*Bot. Centbl., Beihefte, 29 (1912), 1. Abt., No. 1, pp. 1–20, figs. 3*).—This is a report on a series of studies undertaken to ascertain the effect of various chemical agents of different densities of solution upon the transpiration of plants, wheat seedlings being used.

The transpiration per gram of dry matter of the seedlings grown in a complete nutrient solution increased in every case with the decrease in density down to a certain point. It then decreased with further diminution in concentraton, while the actual dry matter produced increased with the rise in density of the solution.

In explanation of the above facts it is held that the increase in transpiration first observed may be due to decreased osmotic pressure of the solution and to decreased density of the cell sap. The subsequent decrease may be due to the decreased stimulative action of the dilute solutions.

It was found that there was a decrease of density of the cell sap to correspond with that in the solution.

The relative transpiration was greater in the sand and soil cultures than in the solution cultures, and greater in the soil than in the sand cultures. The actual dry matter produced was larger in the solution than in the sand or soil cultures and larger in the sand than in the soil cultures.

A bibliography is appended.

The anatomical structure and the related functioning of the water channels in leaflets of dicotyledons, E. Gerresheim (*Ber. Deut. Bot. Gesell., 30 (1912), No. 8, pp. 553–558*).—As a result of a study of leaflets of dicotyls, which is claimed to have been more exact and thorough than studies previously made, the author reaches the following conclusions:

(1) When a leaf transpires uniformly over its whole surface, and all channels leading thereto contain water under the same pressure, each main vascular bundle supplies by means of its branches and in addition to their service a certain portion of the leaf surface, and the same is true of any smaller branch. In case of anastomosing veins no exchange takes place under the conditions

above described. (2) When, on the contrary, root activity produces excessive pressure in a main leaf channel, this can supply equally all neighboring parts of the leaf surface only so far as connections with other bundles permit free flow and as transpiration is equal throughout the leaf. (3) When through injury or bending a main channel is partly or wholly closed, the author's studies are said to show that the whole leaf blade may be almost equally supplied by the cross veins from uninjured channels. (4) A like equalization tends to occur when from any cause transpiration from any part of the surface is excessive or deficient in leaves having the vascular structure described.

The heat produced by leaves, MILDRED SPARGO (*Plant World, 15 (1912), No. 12, pp. 277–293*).—The author presents a report of investigations in which leaves were placed in Dewar and other flasks and carboys, insulated as carefully as possible, to determine whether there was a rise in temperature, as reported by Molisch from his investigations.

As far as possible the methods of Molisch were duplicated, but in only two experiments was there any appreciable rise in temperature. This occurred in one instance in the leaves of Tilia, which rose 6.4° in 7 hours, while in the other there was a rise in the temperature of the leaves of the common black locust. This did not come, however, for 6 days, and the condition of the leaves gave strong evidence of bacterial decay. In all other cases there was practically a gradual diminution of temperature from the beginning to the end of the experiment, and there was no indication of a marked rise in temperature followed by a second maximum, as reported by Molisch.

The influence of temperature on the tropic sensitivity of etiolated seedlings of Avena, T. NYBERGH (*Ber. Deut. Bot. Gesell., 30 (1912), No. 8, pp. 542–553, figs. 3*).—The author studied the effects of temperatures on the tropic sensitivity or so-called perceptivity of coleoptiles of etiolated plants of *Avena sativa*.

It was found that the phototropic sensibility of *A. sativa* remained unchanged on cooling to —3° C., which is within 1° of the point where it was killed by freezing; also that sensibility was retained after 12 hours at 42.5°, 11 hours at 44.5°, or 6 hours at 44.8°. Geotropic sensitivity ceased after about 5 hours at between —2° and —3°, or after about 11 hours at 44.5°.

Chemical protection of plants against freezing.—III, The nature of the protective action, N. A. MAXIMOW (*Ber. Deut. Bot. Gesell., 30 (1912), No. 8, pp. 504–516*).—In previous communications (E. S. R., 28, p. 330), the author has shown the dependence of the degree of protection to plants upon the freezing point of the solution. Such protection ceases at the temperature where the solution begins to congeal. This coincidence of the point where protection ceases with that where congelation begins is interpreted to mean that the solute protects the life of the cell by preventing complete freezing of the water in or in immediate contact with the outer layer of the cell protoplasm (since it is held that death of the cell from cold depends upon the freezing of such water).

It is claimed that this view is supported by the fact, shown by experiments, that mixed solutions in which the congealing point was notably low exerted a marked protective influence on plants against cold, even in cases where one component solution was very slightly protective. It is held that death of the cell from cold is connected primarily with injury, by congelation of the mixture, to the outer layers of the cell protoplasm; and that protection from such death by solutes is due to the prevention of complete congelation by lowering the freezing point of the mixture in that region. Freezing is believed to cause a disturbance of the osmotic properties of the cell, which may lead to its

death. It is thought that establishment of the views set forth may do much to reconcile the hitherto conflicting views regarding the nature of the changes associated with the freezing and thawing out of the cell.

The cause of death, W. W. LEPESCHKIN (*Ber. Deut. Bot. Gesell., 30 (1912), No. 8, pp. 528–542*).—The author states, as the result of investigations, that death is preceded or accompanied by two processes, apparently interdependent, which go on in the living protoplasm. These are (1) the decomposition of the less stable protein compounds, and (2) the coagulation of such proteins. It is suggested that capillary forces play an important part in coagulation, and that coagulation sets free energy and leads to the breaking down of the weaker compounds.

The uniformity in structure of the proteins and their transformations in plant and animal organisms, D. N. PRIANISHNIKOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 5, pp. 673–706, figs. 8*).—In extension of previous work (E. S. R., 9, p. 226; 24, p. 629), the author submits the results of investigations which are claimed to strengthen the analogy found between the transformations of proteins in plant organisms and those occurring in animal bodies.

The formation of glycogen in yeast cells, DIANA BRUSCHI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, No. 1, pp. 54–60; abs. in Bot. Centbl., 119 (1912), No. 24, pp. 596, 597*).—In studies on glycogen formation in yeast cells, the author found that the formation of glycogen is checked or prevented by narcotics or antiseptics only as they limit fermentation, as such formation begins only in connection with the formation of alcohol. The sugar concentration seems normally to have little or no direct influence on the formative process, which, however, is hindered in strong solutions, especially of sugar, in case of plasmolyzed yeast cells, but tends to be restored on the restoration of turgor. Glycogen formation in narcotized cells is not favored by the neutralization of acids. At a certain stage in fermentation, it is thought that a partial reversal of the fermentative process in narcotized cells may be produced by supplying sugar. Glycogen is thought not to act as a reserve substance in case of yeast cells.

The stimulation of plant growth, H. E. ARMSTRONG (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 1, pp. 17–21, pls. 4*).—The author discusses hormones, or those substances capable of passing through the differential septa of plants, and their effect on plant growth through the activation of enzyms, etc.

The use of a manometer in studying the respiration of plants, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 24, pp. 1209–1213, figs. 3*).—The authors describe a method by which the respiration of plants is measured by a manometer.

The germination of heteromorphic fruits and seeds in the same species, H. BECKER (*Bot. Centbl., Beihefte, 29 (1912), 1. Abt., No. 1, pp. 21–143, figs. 24*).—The extended studies by the author with about 46 species of Compositæ, 3 of Cruciferæ, and 4 of Chenopodiaceæ, show that heteromorphism of fruits or seeds is in general associated with differences as regards quickness or final percentage of germination, or with other characteristics, which are indicated in detail in the text and numerous tables. A bibliography is given, also a systematic and an alphabetical index to the species investigated.

The cotton plant in Egypt: Studies in physiology and genetics, W. L. BALLS (*London, 1912, pp. XVI+202, pl. 1, figs. 72; rev. in Gard. Chron., 3. ser., 52 (1912), No. 1350, pp. 347, 348; Agr. News [Barbados], 11 (1912), No. 278, p. 405*).—The author presents in a very condensed form the results of his experiments and observations on cotton in Egypt. The fertilization, cytology,

and embryology of the plant are discussed, after which its development and relation to environment are considered. Notes on a study of the cotton fiber are given in which important data are added to our knowledge.

The most important fungus disease of cotton in Egypt is said to be the soreshin, though other fungi are often very common. The subject of shedding of bolls is considered at some length, and the primary cause is said to be connected with the water relations of the plant. Deficient root absorption or excessive transpiration will induce shedding. Root asphyxiation through water logging of the soil was found to have a similar effect.

The studies on crossing and heredity are reported at some length, and the author's observations are doubtless valuable contributions to our information regarding the behavior of this plant in respect to the acquisition and transmission of characters. The author reports from 5 to 10 per cent of natural crossing in the field, and his observations indicate that all of the hybrids of cotton segregate according to Mendelian law.

The hereditary characters in the potato, R. SALAMAN (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 1, pp. 34–39*).—The results are given of 5 years' work in analyzing the factors which underlie and determine the varying characteristics of the potato plant, with a brief discussion of the flower, fruit, haulm, stolons, cropping, tuber characters, etc.

Flower characters and anther sterility appear to have no relation to crop production. Proneness of stems, especially in dry seasons, shortness of stolons, and disposition of tubers are all considered important characters in potato breeding. The author is led to believe from his experiments that breeding resistance to *Phytophthora infestans* is possible.

FIELD CROPS.

Crops and methods for soil improvement, A. AGEE (*New York, 1912, pp. XV+246, pls. 24*).—In addition to giving methods of soil treatment the author presents from a practical point of view chapters on clovers, alfalfa, grass sods, sods for pasture, the cowpea, other legumes and cereal catch crops, care and use of stable manure, and crop rotations.

The best forage crops, edited by F. G. STEBLER and A. VOLKART (*Die besten Futterpflanzen. Bern, 1913, vol. 1, 4. rev. and enl. ed., pp. 175, pls. 15, figs. 133*).—This book is an exhaustive treatise, the first part of which deals in general with climate, soils, fertilizers, yields, nutritive values, hay, seeds and seeding. The second part gives careful attention to the nomenclature, history, agricultural value, life period, botanical descriptions, varieties, geographical distribution, climate, soil and fertilizers best adapted, manner of growth and development, yield and uses, nutritive value, seeds and seeding, adulterants, diseases, and related species of the following grasses and clovers: *Lolium perenne, L. multiflorum, Dactylis glomerata, Festuca pratensis, Avena elatior, Trisetum flavescens, Holcus lanatus, Phleum pratense, Alopecurus pratensis, Anthoxanthum odoratum, Agrostis alba, Trifolium pratense, T. hybridum, T. repens*, and *Onobrychis sativa*.

Ridge culture, N. A. and B. N. DEMTSCHINSKY (*Die Ackerbeetkultur. Berlin, 1911, pp. 136, figs. 74*).—The authors attempt to show that the ridge method of cultivation has more value as a means of conserving moisture for the immediate crops than is usually accorded to it. Chapters treat of the science of the movement of soil water, the development of the root system and the stooling process under the influence of transplanting and ridging, ridge cultivation and science, the practical methods, and results.

Drought resistance of crops grown at Goodwell, Oklahoma, 1911, J. E. PAYNE (*Oklahoma Sta. Rpt. 1912, pp. 41–47*).—Of the grain sorghums, Black Hulled White Kafir corn and Dwarf Black Hulled White Kafir corn seemed to show more favorably as fodder producers for that climate than Salzer Earliest, Pink and Red Kafir corn, Brown durra, Jerusalem corn, Sudan durra, shallu, White milo maize, and Dwarf Yellow milo maize, while the yield of grain of Brown kowliang exceeded those of all others. All sorghums made a better growth than Indian corn.

An examination of the roots showed that while sorghum roots neither spread wider nor penetrated deeper they were nearly 3 times more numerous than Indian corn roots, which seemed to account for their being better able to resist the drought. An effort is being made to produce seed at an early period and with a small percentage of vegetative growth. A lessening of saccharin matter was noted in Early Amber cane which had grown under droughty conditions for a number of years and had a tendency to produce fewer leaves and smaller stalks than saccharin sorghums.

Report of the first Interstate Dry Farming Conference (*Dept. Agr. So. Aust., Rpt. Dry Farming Conf., 1 (1911), pp. 151, pls. 2*).—This report contains minutes of the meeting, held at Adelaide, March 6–8, 1911, with addresses on Dry Farming in South Australia, Rise and Progress of the Dry Farming Movement, The Question of Rotation in Connection with Dry Farming, Rape and Barley as Adjuncts to Wheat Growing in Dry Areas, Some Knotty Points in Dry Farming, Factors in the Successful Growth of Crops with Limited Rainfalls, Can a System of Agriculture as an Aid to Nature be Successfully Adopted, Wheat Growing in Western New South Wales, and Wheat Growing in the Drier Portions of Queensland.

Report of the imperial agriculturist for the year 1910–11, A. C. DOBBS (*Rpt. Agr. Research Inst. and Col. Pusa [India], 1910–11, pp. 20–25*).—This paper includes brief notes on work done with maize, sorghum, oats, peas, Lathyrus, Cicer, Cajanus (arhar), Sann hemp, guinea grass, flax, rice, and soy beans.

Report of the imperial economic botanist for the year 1910–11, A. HOWARD (*Rpt. Agr. Research Inst. and Col. Pusa [India], 1910–11, pp. 34–49*).—In this paper the author reports investigations on breeding for milling quality in wheat and the culture and improvement of tobacco, hops, san (*Crotalaria juncea*), and patwa (*Hibiscus cannabinus*).

Short introduction into the technique of breeding cereals, L. KIESSLING (*Kurze Einleitung in die Technik der Getreidezüchtung. Berlin, 1912, pp. 44, figs. 13*).—This paper gives detailed directions, deduced from the author's 12 years experience, for the use of beginners in the practical breeding of cereals, from the laying out and handling of the work in the breeding plat to the field multiplication and records in selection and cross-breeding.

Selection of cereal varieties with relation to soils, climate, and cultural conditions, K. VON RÜMKER (*Tagesfrag. Mod. Ackerbau, 1910, No. 5, 2. ed., rev., pp. 58*).—This paper, which is the second revised edition of a portion of a work previously noted (E. S. R., 22, p. 40), discusses from a practical standpoint the value of numerous varieties of rye, wheat, barley, and oats, based upon the work of about 15 experimenters throughout the German Empire.

The influence of fertilization and of cultivation of meadows on the yield, the stand, and the chemical composition of the hay, G. BREDEMANN (*Fühling's Landw. Ztg., 61 (1912), Nos. 5, pp. 166–191; 6, pp. 210–229*).—The author reports on 9 experiments, some begun in 1894, carried on in fields in the vicinity of Cassel. The tests included 30 grasses and legumes treated with Thomas

slag, kainit, and lime in varying amounts, and on both peaty and sandy soils of which the chemical and mechanical analyses are given. The results deal with the botanical composition and resulting chemical composition of the hay, as influenced not only by fertilizers but also by various methods of cultivation with the plow and harrow.

Cultivation with the harrow was favored. Lime brought about a chemical reaction which resulted in the disappearance of the noncalcic group of plants, while the application of phosphorus and potash drove out the mosses and lichens and produced a vigorous growth in the remaining grasses, bringing about a complete change in the stand.

The influence of time of cutting upon the yield and composition of hay, C. CROWTHER and A. G. RUSTON (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 83, 1912, pp. 14*).—Previously noted from another source (E. S. R., 27, p. 234).

Hindupur agave plantation, G. R. HILSON (*Dept. Agr. Madras Bul. 64, 1911, pp. 2*).—After 9 years' experimentation the author concludes that without some cheap mechanical means of extracting the fiber agave can not be successfully cultivated in the Anantapur District, British India.

The cultivation of alfalfa, H. RIVE (*Brit. Columbia Dept. Agr. Bul. 40, 1912, pp. 10*).—This bulletin is a compilation discussing in a popular manner soils, inoculation, fertilizing, and feeding in relation to the production of alfalfa.

Corn culture in the Philippine Islands, S. H. SHERARD (*Philippine Bur. Agr. Bul. 23, 1912, pp. 35, pls. 4, figs. 5*).—This bulletin discusses the present methods and suggests improvements in the cultivation, harvesting, storing, uses, and protection from pests of the corn crop of the islands.

Inheritance of color in the aleurone cells of maize, E. M. EAST (*Amer. Nat., 46 (1912), No. 546, pp. 363–365*).—The author shows by a discussion of results of former work that a hypostatic color factor is often necessary for the production of an epistatic color of a plant. All of the tests seemed to corroborate the interpretation that the purpling factor can produce purple only when a reddening and a basic color factor are present.

Heredity and cotton breeding, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 256, pp. 113, pls. 6, figs. 19*).—This bulletin, in presenting a general discussion of cotton breeding, outlines some new methods and standpoints for the study of heredity with applications to practical problems in the breeding of this plant. It is pointed out how problems of heredity and methods of breeding can be simplified by recognizing that the expression of characters is distinct from transmission, and detailed information is given regarding the habits of different types of cotton, the effects of external conditions, and behavior of the different characters in heredity.

Incorporated into the discussion are the results of experiments with Kekchi cotton in Texas. This cotton, under the new conditions, changed the expression of nearly all its characters, the changes in the shape and habits of the plants resulting from the fact that the fruiting branches of the normal plants were more or less completely replaced by vegetative branches. Other alterations in the habits of growth included many changes in the form and texture of the leaves, the structure of the involucre, the number of carpels, and the length and abundance of the lint. It was found that in 5 or 6 generations, the expression of the normal characters was reestablished, including an increase in the size of the bolls and in the length and abundance of the fiber equal to that of the best plants of the original Guatemalan stock. The 3-locked bolls occurring frequently on the large, infertile, unacclimatized plants were replaced by a normal proportion of 5-locked bolls. The results of

observations in this connection are tabulated in detail. "In acclimatizing a superior type of cotton we do not make the variety over by creating new characters, but merely bring back to normal expression characters that the variety is already known to possess. Success with this kind of acclimatization depends primarily on knowledge of the normal habits and characters, so that the variety may be guided back to normal behavior by the selection of individuals and progenies that show most definite and regular expression of the normal characters."

In a statement of general conclusions regarding the nature of heredity, the author points out that heredity includes transmission and expression as distinct processes. Transmission is considered independent of expression, as characters can be transmitted through many generations in a latent condition without being brought into expression. "Expression is influenced by the mutual relations among the characters as well as by external conditions and methods of breeding. The investigation of expression relations should not be limited to empirical discovery of correlations by measurements of sizes, weights, or colors, but should include a biological recognition of expression relations in unimproved stocks and in hybrids." The function of selective breeding is defined as securing more regular expression of a desired set of characters, and it is stated that continued selection is required to maintain the uniformity of superior varieties, because of the persistent tendency of the suppressed characters, suppressed by selection but not eliminated from transmission, to return to expression. Selection is regarded as regulating the expression of characters and it is pointed out that it is not known to have any influence over the transmission of characters or the addition of new characters to the content of transmission.

In an extended summary of applications to methods of breeding, attention is called to the fact that uniform expression of characters is not a natural condition of heredity in a cross-fertilized plant like cotton, but that it has to be secured and maintained by selection, the value of which does not depend on the possibility of securing further improvement, but on avoiding degeneration by loss of uniformity. It is further pointed out that characters of no practical value in themselves may be worthy of careful study as indications of changes of expression of other characters, as in the case of the paler petal spots that are regularly accompanied by small bolls in the Jannovitch variety of Egyptian cotton.

"Both in hybrids and in individual variations of selected stocks of cotton there are relations of expression between boll characters and lint characters, so that the nature of the lint can be judged by inspection of unopened bolls and undesirable variations rejected in advance of the harvesting of the crop.

"The 2-color characters of cotton flowers, the yellow of the petals and the purple of the spots, have very different expression relations. In hybrids between Egyptian and Upland varieties the expression of the lemon-yellow color of the Egyptian petals accompanies other Egyptian characters and is only very rarely combined with distinctive Upland characters. The purple base of the Egyptian petals combines much more readily with Upland characters. . . .

"Variations toward Upland or Hindi characters arising in dilute hybrid stocks of Egyptian cotton have been found to yield progenies with more stable expression of characters than direct hybrids between Egyptian and Upland cotton. Such facts suggest the possibility of developing a new method of breeding by dilute hybridization."

Report of the imperial cotton specialist for the year 1910–11, G. A. Gammie (*Rept. Agr. Research Inst. and Col. Pusa [India], 1910–11, pp. 80–102*).—

Notes are given on the growth and appearance of numerous varieties of cotton in the Central Provinces and Bombay, Madras, Bengal, and the Punjab, with remarks on cultural experiments, market grades, and values.

Notes on hops, E. S. SALMON (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 453–472*).—A description with reference to disease resistance is given of 47 varieties. A table shows the soft resin content to range from 6.48 to 13.65 per cent in some varieties of unknown parentage; in German varieties grown at Wye, from 10.18 per cent in a "Stirn" variety to 14.28 per cent in Halladau; in American varieties grown in America, from 9.74 per cent in Grant Pass to 12.26 per cent in an unknown variety; and in English varieties from 9.33 per cent in Canterbury Whitebine to 13.29 per cent in Worcester.

Comments on the sending out of male hops to growers in Kent and Surrey are also noted.

Nonperennial medicagos: The agronomic value and botanical relationship of the species, R. MCKEE and P. L. RICKER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 267, pp. 38, pls. 13*).—This bulletin gives results of an investigation of 20 species and subspecies of bur clover in comparison with 3 species already grown in the United States.

It is pointed out that the feeding value of these as indicated by chemical analysis and general experiences is good, but for general use they seem to be adapted to sections having a very mild winter climate.

Some yields of hulled seed secured at Chico, Cal., from 1908 to 1911 varied from 40 lbs. per acre by *Medicago hispida terebellum*, in 1910, to 1,160 lbs. by *M. orbicularis* in the same year. A bushel of hulled seed weighed about the same as alfalfa (60 lbs.). The weight of seed in a bushel of burs in the different species varied from 1.75 lbs. in *M. arabica*, to 4.66 in *M. turbinata*, and the weight of seed in 100 lbs. of burs from 20.89 lbs. in *M. turbinata*, to 33.78 lbs. in *M. hispida denticulata*.

The intermediate form between wild oats (Avena fatua) and cultivated oats (A. sativa), ZADE (*Fühling's Landw. Ztg., 61 (1912), No. 11, pp. 369–384*).—Characteristics of various forms and crosses are noted and discussed.

Experiments with the old Norwegian varieties of oats, W. CHRISTIE (*Fühling's Landw. Ztg., 61 (1912), No. 9, pp. 297–313, figs. 8*).—The results in this article show a white variety of oats to have had medium growth, small leaf, slender stalk, heavy stooling, a full kernel, and the base of the outside grain short-haired, as compared with a gray variety which had a tall growth, wide leaf, thick stalk, weak stooling, a pointed kernel and the base of the outer kernel long-haired.

On differential mortality with respect to seed weight occurring in field cultures of Phaseolus vulgaris, J. A. HARRIS (*Amer. Nat., 46 (1912), No. 549, pp. 512–525, figs. 3*).—On the basis of a large collection of data here presented in tables and diagrams, the author concludes that both large and small seed are less capable of developing into fertile plants than are those which do not deviate so widely either above or below the type.

[Variety tests of potatoes for starch production], C. VON ECKENBRECHER (*Ztschr. Spiritusindus., 1912, Ergänzungsh. 1, pp. 3–60*).—This paper gives an extended report of experiments with 20 varieties of potatoes that have been conducted at 30 different localities during the years 1888–1911, and designed primarily to throw light on the production of starch, but also including data on yield, fertilization, disease resistance, storage and cooking qualities, and the origin and history of some of the varieties. Detailed tabulated results follow.

[Influence of nitrogen on the protein content of potatoes], I. F. HOFFMANN (*Ztschr. Spiritusindus., 1912, Ergänzungsh. 1, pp. 61, 62*).—The tabulated re-

sults referred to above show that of numerous varieties of potatoes grown at 8 different stations in Germany the lowest protein content was 6.52 per cent and the highest 17.56 per cent of the dry matter. These results are compared with the starch content and size of tubers of the respective varieties.

Study of rice culture in Java, S. V. SIMON (*Tropenpflanzer, 16 (1912), Nos. 9, pp. 459–484; 10, pp. 527–542; 11, pp. 581–591; 12, pp. 645–660, figs. 14*).—This article describes the methods and systems of irrigation practiced in the cultivation of rice on the island, deals with the harvesting, crop rotation which includes goldfish breeding, and diseases and pests of rice, and discusses the action and chemical composition of irrigation water, the upland methods of cultivation, yields, and varieties.

The principles of paddy manuring, W. H. HARRISON (*Dept. Agr. Madras Bul. 63, 1911, pp. 8*).—In part 1 the author concludes that in view of the puddled and flooded conditions of the soil under the usual methods of paddy cultivation, bulky organic manures which readily decompose under anaerobic conditions and commercial manures are of great value, and that nitrogen and phosphoric acid must be applied to all such soils, while potash is only occasionally needed. Part 2 discusses the use of green manures, poonacs or oilcake, barnyard manures, and fish, bone, mineral, and artificial fertilizers in their application to paddy culture in southern India.

Report on experiments in the cultivation of sugar beet in 1911 (*Bd. Agr. and Fisheries [London], Rpt. Expts. Cult. Sugar Beet, 1911, pp. 56, pls. 2*).—The results of experiments at 7 agricultural colleges indicate that beets of high sugar content may be grown in England successfully. Analyses showed a maximum of 20.7 and a minimum of 15.2 per cent sugar, with a net (factory weight) yield of from 4.5 to 18.8 tons per acre.

Report on sugar beet experiments, 1911, D. TURNER (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 22–30*).—Previously noted from another source (E. S. R., 26, p. 636).

Sugar at a glance, T. G. PALMER (*U. S. Senate, 62. Cong., 2. Sess., Doc. 890, pp. 63, pls. 4, figs. 42*).—Charts and other data regarding sugar production.

Sweet clover. A field survey of its distribution, soil adaptation, habits, and agricultural value, W. A. LLOYD (*Ohio Sta. Bul. 244, pp. 589–684, figs. 36*).—This bulletin gives the record of a field survey made for the purpose of ascertaining the value of sweet clover for use as a soil ameliorant, forage crop, or for other agricultural purposes, and presents a compilation of further data secured from numerous Ohio farms, agricultural colleges, experiment stations, and American consuls.

Some of the more prominent features mentioned are the adaptation of sweet clover to hard, compact soils, exposed subsoils, stony situations, and conditions too adverse for most other plants to thrive, and that when used as a green manure it usually added more humus-forming material to the soil than any other crop. It thrived best on soils rich in lime and often required inoculation. It was found to inoculate soil for alfalfa in some cases. A bibliography is appended.

Sweet clover. A field investigation of the possibilities of this plant as a soil restorer, W. A. LLOYD (*Ohio Sta. Circ. 129, pp. 5–14, figs. 7*).—A popular summary of the above.

Notes on smoking qualities of the tobacco, M. J. R. DUNSTAN (*Jour. Southeast. Agr. Col. Wye, 1911, No. 20, pp. 394–396*).—Rather unsatisfactory results are reported from an attempt to produce a tobacco containing a high percentage of nicotin, making it suitable for the preparation of insecticides but too coarse for smoking purposes.

Tobacco marketing in the United States, E. H. MATHEWSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 268, pp. 67, figs. 10*).—This bulletin gives the history, development, and present status of various systems of warehousing, inspection, and auction sales as related to marketing the product in the various tobacco-growing districts of the United States.

Tobacco crop, 1912, by types and districts, J. P. KILLEBREW (*U. S. Dept. Agr., Bur. Statis. Circ. 43, pp. 8*).—This circular contains tables showing, by States and by types, the area, yield per acre, production, and farm value of tobacco in the United States on December 1 of 1909, 1910, 1911, and 1912, with comments on cigar and chewing, smoking, snuff, and export types.

Questions in regard to changes in wheat varieties, SCHMIDT (*Fühling's Landw. Ztg., 61 (1912), No. 14, pp. 487–494*).—This article discusses the increase and improvement in wheats and attendant variations since 1901 with special reference to those in German Provinces.

On the inheritance of some characters in wheat, I, A. and G. L. C. HOWARD (*Mem. Dept. Agr. India, Bot. Ser., 5 (1912), No. 1, pp. 47, pls. 3*).—In a study of the effect of crossing felted and smooth chaff wheat it was noted that the hairs on the chaff of felted wheats varied considerably in length and density and that one or more kinds of hairs may be present in the same wheat. Each kind of hair proved to be due to a single factor and these factors seemed to be inherited independently of one another, as also did the factors influencing the color of the grain. It is pointed out that owing to the demonstration of the existence of at least 2 factors in the bearding of wheats, a sharp distinction should be drawn between absolutely beardless wheat and those having short awns or tips.

Work on color of awns, consistency of the grain, shattering of the grain, and standing power is also reported, with a list of the varieties used.

Wheat-growing in relation to rainfall, J. B. TRIVETT (*Sydney, N. S. Wales: 1912, pp. 5, pl. 1*).—A popular discussion of wheat growing in New South Wales with a map showing the recent extension of the wheat belt.

Wheat growing under irrigation, E. P. HUMBERT (*New Mexico Sta. Bul. 84, pp. 16, fig. 1*).—In this bulletin time of seeding, cultural methods, including the cost of irrigation, methods of harvesting and threshing, and results of a variety test are considered.

Of the 24 varieties reported, covering a period of 9 years, only 1 averaged below 37 bu. per acre, while 20 yielded above 40 bu. and 2 above 50 bu. The highest yields were by Hedgerow and Kehl, both of which yielded 80 bu. per acre in 1902; the lowest was by Paros in 1908 of 6.5 bu.

The experiments in time of seeding spring wheat showed a rapid decrease in yield of those sown after February. The most propitious time seemed to be from October to the last of February, and for winter wheat early in September

Eighth annual report of the Canadian Seed Growers' Association for the year ending March 31, 1912 (*Canad. Seed Growers' Assoc. Rpt., 8 (1912), pp. 142, pls. 8*).—This report of the proceedings includes among other material the following addresses: Ways and Means of Facilitating the Distribution of Registered Seed in the Maritime Provinces, by E. S. Archibald; Some Observations as a Judge in Competitions of Standing Fields of Corn, by J. H. Coatsworth; The Commercial Handling and Storing of Seed Potatoes, by W. Naismith; and Distribution of Seed at Experimental Farms, by C. E. Saunders.

Bibliography of foreign literature relating to agronomy, 1910, A. CHRISTENSEN (*Tidsskr. Landbr. Plantecavl., 19 (1912), No. 1, pp. 124–178*).—References to papers in 156 different periodicals, reports, etc., published during the year are given.

HORTICULTURE.

Proceedings of the Society for Horticultural Science, 1908 and 1909 (*Proc. Soc. Hort. Sci., 1908–9, pp. 64*).—This meeting has been noted editorially (E. S. R., 21, p. 401). Papers not specifically referred to previously were as follows: Overcoming Winter Injury, by W. T. Macoun; Notes on Pruning, by W. R. Lazenby; A General Survey of the Properties, Preparation, and Use of Concentrated Lime-Sulphur, by J. P. Stewart; The Point of View of a Station Director in Administering the Adams Fund, by S. W. Fletcher; and Adams Act Research at Cornell, by H. J. Webber.

Proceedings of the Society for Horticultural Science, 1910 (*Proc. Soc. Hort. Sci., 1910, pp. 82*).—A report similar to the above in which the following papers and discussions before the meeting at Tampa, Fla., February, 1911, are reported:

Comparative Tests in Seed Germination, by W. R. Lazenby; Factors which Determine Color in the Forcing of Roses, by M. A. Blake; Self-Sterility of Rotundifolia Grapes, by F. C. Reimer; The Rest Period in Plants, by W. L. Howard; Distribution of Peach Yellows in Nursery Stock, by M. A. Blake; Horticultural Records of Disease Resistance, by W. A. Orton; Some Results of Cabbage Crosses, by H. L. Price; Some Experiments with Preservatives for Retaining the Shape and Color of Strawberries, by W. R. Ballard; The Brown Spot of the Navel Orange, by J. E. Coit; The Importance of the Subject of Vegetable Gardening in the College Curriculum, by L. C. Corbett; Some Unusual Tomato Variations, by J. B. S. Norton; Sex in *Carica papaya* and Its Relation to Breeding and Culture, by J. E. Higgins; and A Mechanical Scheme for the Grouping of Varieties, by R. S. Mackintosh.

Proceedings of the Society for Horticultural Science, 1911 (*Proc. Soc. Hort. Hort. Sci., 1911, pp. 122, pls. 4*).—This comprises a report similar to the above for the eighth annual meeting, Washington, D. C., December 29, 1911, at which the following papers were presented:

Characteristics of McIntosh Apple Seedlings, by W. T. Macoun; The Hereditary Transmission of Characters of Apples, by U. P. Hedrick and R. Wellington; Horticultural Investigation in America, Its Status and Outlook, by S. A. Beach; Class Room Methods of Teaching Pomology, by C. S. Wilson; The Sequence and Development of Courses in Horticultural Instruction, by A. T. Erwin; Teaching Pomological Laboratory Work, by W. Paddock; Factors Influencing Yield, Color, Size, and Growth in Apples, by J. P. Stewart; The Use of the Brix Spindle in Determining the Sugar Content of Fruit Juices, by W. B. Alwood; Variation within Varieties of Cabbage and Tomatoes, by C. E. Myers; Fruit Bud Formation and Development, by A. W. Drinkard, Jr.; Factors which Influence the Blooming and Ripening Period of Peaches, by M. A. Blake; Investigations on Frost Fighting, by C. J. Lewis; A Suggestion in Regard to the History of Grape Growing in America, by N. O. Booth; and Notes on North European Horticulture, by W. R. Lazenby.

Southwestern beans and teparies, G. F. Freeman (*Arizona Sta. Bul. 68, pp. 573–619, pls. 8, figs. 2*).—This comprises a varietal and cultural study of 2 types of beans native to the Southwest to determine their adaptability, both as a soil improver and as an economic food crop for that region.

A large number of varieties of the 2 types were collected from the Indians of southern Arizona. These 2 types are recognized by the Indians as distinct and are commonly known as "frijoles" and "teparies." A botanical study has shown that the frijoles belong to the group of common kidney beans (*Phaseolus vulgaris*), whereas the teparies, which have been hitherto unrecognized in horticultural literature, belong to the variable group described by Gray as *P. acutifolius*.

The author concludes that the teparies were probably not domesticated from the type form of *P. acutifolius* but from a larger, more robust, broad-leaved variety of the species described by Gray as distinct but left unnamed. As a result of these investigations, the tepary is here added to the list of species of beans used as esculents, and it is suggested that the form be called *P. acutifolius* var. *latifolius*.

Twenty-three varieties of frijoles and 47 distinct kinds of teparies have been tested at the station. Analyses are given showing the food value of both types and the more promising sorts are described and illustrated in color. Tests of these native grown beans have resulted in yields of from 450 to 700 lbs. per acre by dry farming and from 800 to 1,500 lbs. under irrigation. In the 9 experiments herein reported where frijoles and teparies have been compared, the latter beans have averaged 4 times the productiveness of the former. The tepary is consequently recommended to the attention of southwestern farmers as the variety of bean best adapted to an exacting climate and as a probable money crop available both to irrigators and to dry farmers.

Orchard management investigations, C. G. WOODBURY (*Indiana Sta. Rpt. 1912, pp. 55–57*).—Moisture, humus, humus nitrogen, and soil temperature records taken in the orchard management experiments of the station are given, together with data on the gross and net income secured in a number of demonstration orchards.

Horticultural research.—II, Tree pruning and manuring, S. PICKERING (*Sci. Prog. Twentieth Cent., 7 (1913), No. 27, pp. 397–412, pls. 3, fig. 1*).—This is the second of a series of popular articles discussing the results obtained at Woburn in investigations of the culture of fruit trees (E. S. R., 28, p. 236).

Grape stocks for American grapes, U. P. HEDRICK (*New York State Sta. Bul. 355, pp. 483–515, pls. 5, fig. 1*).—An account is here given of an experiment started in 1902 to determine the adaptability of various root stocks for the best varieties of American grapes. The stocks, which included St. George, Riparia Gloire, and Clevener together with the varieties used as scions, are described, and a record is given of the experiment from year to year.

The experiment has had so many drawbacks during the 11 years of trial, including disastrous weather conditions and serious attacks by the grape rootworm (Fidia), that it is considered a partial failure. There appeared to be, however, certain well-defined comparisons between the grafted grapes and those growing on their own roots. Grafted grapes were more productive, the crops being increased through the setting of more bunches and the development of larger bunches and berries. The average yield of all the varieties on their own roots was at the rate of 4.39 tons per acre as compared with 5.62 on Clevener, 5.36 on St. George, and 5.32 on Gloire. The vigor of the vines on the different stocks corresponded closely with the yields. As a rule the grapes on the grafted vines ripened a few days earlier than those on their own roots. A few varieties growing on St. George were retarded in ripening.

The deduction is drawn from the experiment that it may be profitable to grow some of the fancy grapes of the region on grafted vines and that it is well within the bounds of possibility that the main crop of grapes can be profitably grafted. The station is repeating the experiment and it is recommended that grape growers try small vineyards of grapes grafted on the stocks herein named. Some practices employed in California in starting a grafted vineyard are given (E. S. R., 18, p. 549).

New York grapes on new roots, F. H. HALL (*New York State Sta. Bul. 355, popular ed., pp. 3–11, fig. 1*).—A popular edition of the above.

New device for sorting oranges (*Cal. Fruit Grower, 47 (1913), No. 1286, pp. 6, 7*).—The device here described consists of a zinc-lined chamber through which a stream of water is forced by means of a 4-in. centrifugal pump. The oranges are dropped one at a time into the swiftly moving current. The sound and unfrosted fruit sinks to a greater depth than the lighter and damaged fruit and passes out of the chamber through a different outlet than the latter. Tests of this device are said to have resulted very satisfactorily.

Notes on Robusta and similar varieties of coffee, C. J. J. VAN HALL (*Teysmannia, 23 (1912), No. 10–11, pp. 620–644*).—This comprises an account of the introduction and culture of Robusta and other varieties of coffe in Java.

Sweet pea studies.—II, Winter-flowering sweet peas, A. C. BEAL (*New York Cornell Sta. Bul. 319, pp. 619–656, pls. 5, figs. 7*).—This is the second report on the sweet-pea investigations started at the station in 1909 (E. S. R., 25, p. 645). In the present bulletin the author traces the origin of the various groups of winter-flowering varieties of sweet peas, including notes on the varieties of the garden type formerly grown under glass; discusses the culture and care of sweet peas under glass; gives data on variety tests conducted at the station; and describes the various winter-flowering sweet peas and such other kinds as are used for forcing.

Some 73 varieties were grown at the station 2 seasons under glass and 1 season in the open. Data are given showing the planting time each season and the number of days required to bring the variety into bloom. A study of the winter-flowering type shows it to be absolutely distinct in its habit of growth and in its early flowering characteristic. The winter-flowering peas grow rapidly from the start until they attain a height of from 2 to 4 ft. They then begin to flower freely, after which time side shoots are developed, whereas the garden types planted under glass apparently stand still for a time while side shoots are being developed. The winter-flowering peas planted in September bloom between Thanksgiving and Christmas, whereas the garden types require the entire winter for growth and do not bloom until spring. Winter-flowering peas make their greatest growth under glass, but will flower early and very profusely when planted in the open ground in the spring. The tests at the station indicate that the open-flowered strains of the winter-flowering peas are apt to take preference over the hooded varieties as the commercial type since the hooded varieties are often too much hooded and the flowers do not give the appearance of their real size.

Sweet pea studies.—III, Culture of the sweet pea, A. C. BEAL (*New York Cornell Sta. Bul. 320, pp. 661–713, pls. 11, figs. 9*).—This is the third of a series of reports on sweet-pea investigations. (See above abstract.)

Part 1 contains a discussion of the botany of the genus Lathyrus, together with an artificial key and descriptions of the species. Part 2 contains a historical account of the sweet pea in botany and in horticulture, and of its evolution to present types. Consideration is also given to the pollination of the sweet pea, dwarf sweet peas, the culture and care of garden sweet peas, and methods of exhibiting sweet peas.

The author's observations relative to the pollination of sweet peas tend to show that normal fertilization takes place without the aid of insects and before the flower is fully open. It is believed that a further test of varieties which are known to be fixed, as well as those possessing rogues of certain color, will throw some light on the question of cross-fertilization "if there be any" in the sweet pea.

Observations relative to the dwarf sweet peas indicate that the unpopularity of this type can be largely overcome if they are used for edging or bedding

purposes only and grown under favorable conditions. The conditions necessary for the successful culture of the dwarf sweet peas appear to be a rather dry, moderately rich soil, a dry, hot season, good cultivation, and prompt removal of the withered flowers and pods to prolong the blooming season.

Old-fashioned gardening, GRACE TABOR (*New York, 1913, pp. IX+263, pls. 36*).—This popular work comprises a historical account of old-fashioned gardens in the United States, together with suggestions for their reconstruction. A bibliography of literature relating to early gardens is included.

The Wisconsin nursery and orchard inspection service, 1910–1912, J. G. SANDERS (*Wisconsin Sta. Bul. 227, pp. 38, figs. 13*).—This bulletin discusses the nature of the work of the nursery and orchard inspection service in Wisconsin, indicates the precautions which should be taken in the sale and purchase of nursery stock, and describes the more important nursery pests and diseases observed during the period of the report.

A list is given of licensed Wisconsin nurserymen and dealers, together with outside nurseries licensed in Wisconsin. Laws dealing with the nursery and orchard inspection and insecticides and fungicides are appended.

The destructive insect and pest act and regulations issued thereunder, C. G. HEWITT (*Canada Expt. Farms Bul. 7, 2. ser., 1911, pp. 13*).—This bulletin gives the text of the act and regulations, and furnishes other information on the conditions governing the importation of nursery stock into Canada. See also a previous note (E. S. R., 26, p. 256).

Legislation in Canada to prevent the introduction and spread of insects, pests, and diseases destructive to vegetation with regulations regarding the importation of vegetation into Canada, C. G. HEWITT (*Canada Expt. Farms Bul. 11, 2. ser., 1912, pp. 36*).—This replaces Bulletin 7, noted above, and also includes the text of provincial legislation and other data.

Spraying calendar for 1913 (*Off. Path. Rogue River Valley* [*Oreg.*] *Bul. 10, folio*).—This calendar contains directions for the preparation and use of various insecticides and fungicides.

FORESTRY.

Trees in winter, their study, planting, care, and identification, A. F. BLAKESLEE and C. D. JARVIS (*New York, 1913, pp. 446, pl. 1, figs. 503*).—The introductory part of this work deals with the planting and care of trees with special reference to the individual and his home grounds rather than for a municipality. Part 2, which comprises a guide to the identification of our common trees in winter, is a slightly revised presentation of the authors' New England Trees in Winter, which previously appeared in bulletin form (E. S. R., 26, p. 442).

Investigations on spruce wood, M. RUDELOFF (*Mitt. K. Materialprüfungsamt Gross-Lichterfelde West, 30 (1912), No. 7, pp. 349–400, figs. 28*).—The investigations here reported include tests to determine the relative strength of spruce timber from Hartz and from West Prussia, and also to determine the influence of game injury upon the strength of spruce timber. The strength tests included pressure, bending, tension, shearing, and cleaving tests. Determinations were also made of the moisture content of the samples, the specific weight, and of shrinking and swelling. The results are tabulated and discussed.

No differences were noted between the strength of timbers from the two regions which could be attributed to regional conditions. Likewise, it was found that trees which had been partially barked by animals were materially as strong as similar, uninjured trees.

Eucalyptus hardwood trees of California, A. R. HEATH (*Chicago [1913], pp. 33, figs. 35*).—An account of the present status of the Eucalyptus industry in California.

Eucalyptus in northwest India, R. N. PARKER (*Indian Forester, 39 (1913), No. 2, pp. 81–86*).—A review of experimental tests of eucalypts in northwest India.

Useful exotics in Indian forests.—I, Prosopis juliflora, R. S. HOLE (*Indian Forest Rec., 4 (1912), No. 3, pp. 28, pl. 1*).—An account of the mesquite (*P. juliflora*) relative to its taxonomy, description, distribution and habitat outside of India, history in India, and economic importance.

What shade trees for planting in Kansas? C. A. SCOTT (*Farmers Mail and Breeze, 42 (1913), No. 50, pp. 3, 13, figs. 4*).—Approved lists of shade trees for different parts of the State are given.

The climax forest of Isle Royale, Lake Superior, and its development, II, W. S. COOPER (*Bot. Gaz., 55 (1913), No. 2, pp. 115–140, figs. 16*).—In continuation of a previous paper (E. S. R., 28, p. 440) on this subject, the author discusses the various successions which have led up to the development of the present forest.

Ninth annual report of the state forester [of Massachusetts], F. W. RANE (*Ann. Rpt. State Forester Mass., 9 (1912), pp. 108, pls. 13*).—A review of forest operations in Massachusetts for 1912, including the work on the state nurseries and plantations, assistance rendered to private woodland owners, fire protection work, suppression of the chestnut bark disease and the gipsy and brown-tail moths, new forestry legislation, and a financial statement for the year.

Fourth annual report of the state forester. Forestry practice in Vermont, A. F. HAWES (*Ann. Rpt. State Forester Vt., 4 (1912), pp. 59, pls. 4*).—Part 1 of this report contains suggestions relative to legislation with reference to private cutting, taxation, land registration, and forest fire protection. Part 2 comprises a progress report for the year along lines of forest education, planting operations in state nurseries and forests, and forest fire protection, including a statement of the nature of assistance rendered by the Forest Service of the U. S. Department of Agriculture in the prevention of fires. A brief review is given of private forestry undertaken together with a paper on the relation of forests to run-off and stream flow.

Report of the state forester of Wisconsin for 1911 and 1912, E. M. GRIFFITH (*Rpt. State Forester Wis., 1911–12, pp. 102, pls. 10*).—This report is discussed under the general headings of forestry problems on state lands, forestry problems in general, state forest reserves, education, and statistics.

Official proceedings of the division of forestry of the Royal Prussian Ministry for Agriculture, Domains, and Forests, 1911 (*Amtl. Mitt. Abt. Forsten K. Preuss. Min. Landw. [etc.], 1911, pp. IV+47*).—A statistical review of the administration, management, and exploitation of the Prussian state forests and domains.

Progress report on forest administration in the Northwest Frontier Province for the forest year, 1911–12, W. MAYES (*Rpt. Forest Admin. Northwest Frontier Prov., 1911–12, pp. 3+II+18+XXIX*).—A progress report on the constitution and management of the state forests of the Northwest Frontier Province for the year 1911–12. The more important data, relative to alterations in areas, forest surveys, forest protection, miscellaneous work, yields, revenues, and expenditures, are appended in tabular form.

Annual progress report upon state forest administration in South Australia for the year 1911–12, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust.*,

1911–12, pp. 16, pls. 8).—This is the usual progress report on alterations in forest areas, and planting and other forest operations, including a financial statement for the year.

Handbook of forestry.—II, Principles of production; III, Forest management, T. LOREY, edited by C. WAGNER ET AL. (*Handbuch der Forstwissenschaft. II, Produktionslehre; III, Betriebslehre. Tübingen, 1912, 3. rev. and enl. ed., vols. 2, pp. XII+641, pls. 2, figs. 49; 3, pp. XII+686, figs. 209*).—The present edition of these volumes has been revised and enlarged by the editor in cooperation with other forestry writers. In volume 2 under the general heading of principles of production, silviculture, forest protection, torrent and avalanche control, forest utilization, and forest-chemical technology are considered in detail. In volume 3 are considered forest finance and statics, forest surveys, dendrometry, organization, transportation, and administration.

The theory and practice of working plans, A. B. RECKNAGEL (*New York and London, 1913, pp. VIII+235, pls. 6, figs. 2*).—In this work, which is offered both as a text-book and as a guide to the practicing forester, the author aims to present some of the best European practices in the development of working plans and to adapt them to the present needs of American forestry.

In part 1 the foundations of working plans are considered in detail. Part 2 describes the practice of working plans in various European countries, shows the progress which has been made in the development of working plans in this country by the Forest Service of the U. S. Department of Agriculture, and gives an outline for a plan of silvicultural management.

Investigations upon the longevity and the death of the elements of wood bodies, A. FRITZSCHE (*Untersuchungen über die Lebensdauer und das Absterben der Elemente des Holzkörpers. Inaug. Diss., Univ. Leipsic, 1910, pp. 52*).—A review of the literature on the subject, including an account of the author's investigations of microtome sections of wood disks and borings secured from various trees and shrubs, with a view to tracing the longevity of the different wood elements. Considerable variation in the life of these elements was found both between species and within the species.

Biltmore timber tables, H. R. KRINBILL (*Biltmore, N. C. [1911], pp. 12*).—This booklet comprises tables for estimating the contents and value of standing timber. The original material consists of compound interest keys for solving financial problems, keys for mental calculation of areas of circles, and form height factors for estimating standing timber in board feet of lumber and in cords of wood and bark.

Wood-using industries of Connecticut, A. H. PIERSON (*Connecticut State Sta. Bul. 174, pp. 96, tables 2*).—This comprises a report of an investigation conducted by the Forest Service in cooperation with the Connecticut State Station to determine the amount and kinds of Connecticut wood utilized by the various wood-using industries of the State. Tabular data showing the consumption of domestic and imported wood by species and by industries, including also the kinds of wood used by each industry and the average cost per thousand feet of the different kinds of wood used, are given and discussed.

A list is appended showing the use of domestic and foreign woods in the manufacture of various articles, together with a directory of wood-using manufacturers.

Forest products of Canada.—Lumber, square timber, lath, and shingles, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 34. 1913, pp. 35*).—This comprises a statistical account of the quantity of wood manufactured into lumber, square timber, lath, and shingles in the Dominion and the various Provinces for the calendar year 1911, the total cost and the

average cost per thousand feet, board measure, with the proportion of the total product manufactured in each Province. Each kind of wood is considered in detail. The total value of these products was $82,321,664 as compared with a total value of $83,989,197 for 1910 (E. S. R., 26, p. 544).

Forest products of Canada, 1911.—Poles and cross-ties, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 35, 1913, pp. 18*).—The first part of this bulletin contains data relative to the cross-ties purchased by steam and electric railway companies in Canada during 1911 with reference to the species used and the method of manufacture. The preservative treatment of railway ties is also briefly discussed. The second part of the bulletin shows the number of poles purchased in 1911, by companies, by length classes and species. The data given show the number, value, and average value. The report concludes with a discussion of financial saving due to creosote treatment of poles, based upon investigations conducted by the Forest Service of this Department (E. S. R., 25, p. 344).

The preparation of plantation Para rubber, B. J. EATON (*Dept. Agr. Fed. Malay States Bul. 17, 1912, pp. 58*).—A preliminary report of laboratory experiments and field observations, conducted under the direction of the Federated Malay States Department of Agriculture, relative to various methods of coagulating the latex of *Hevea brasiliensis*.

Note on the utilization of bamboo for the manufacture of paper pulp, R. S. PEARSON (*Indian Forest Rec., 4 (1912), No. 5, pp. II+121, pls. 4*).—This comprises a further report on the investigations of bamboo as material for the production of paper pulp, conducted under the direction of the Forest Research Institute, Dehra Dun, India (E. S. R., 27, p. 647).

Part 1 of this report contains a general discussion of the paper pulp industry in India. The succeeding parts deal with bamboos, their mode of growth and possible outturn; the cost of manufacturing bamboo paper pulp; detailed reports on the various bamboo areas in Burma and India; cost of plant required for a mill; and chemicals available and their cost.

Merits of different woods for street paving, H. G. DAVIS (*Engin. News., 69 (1913), No. 7, p. 302*).—An abstract of a paper read at the annual meeting of the American Wood Preservers Association, Chicago, January, 1913.

DISEASES OF PLANTS.

Vegetable pathology, H. TRYON (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1911–12, pp. 101–103*).—Notes are given on different fungus and other diseases of agricultural, orchard, and other crops, and an outline is presented of field work which has been limited to a study of the diseases affecting the potato crop and the prickly pear.

Some rusts of tropical plants, R. AVERNA-SACCÁ (*Bol. Agr. [São Paulo], 13. ser., 1912, No. 3, pp. 191–207, figs. 10*).—This discussion of tropical rusts deals briefly with the appearance, ravages, and control of *Puccinia psidii*, found on buds, young shoots, leaves, flowers, and fruits of *Psidium goiaba*, also on *P. araca;* of *Uredo flavidula*, on *Jambosa vulgaris;* and of *U. eugeniarum*, on *Eugenia uvalha*. It is stated that the use of sulphates of copper and iron in combating these rusts has not given satisfactory results. Removal and burning of all affected parts, especially of fruits either fallen or hanging on the tree; rational pruning for admission of sunlight and air; and aeration of the soil by drainage are recommended for this purpose.

The dispersal of spores by Uredineæ, P. DIETEL (*Mycol. Centbl., 1 (1912), No. 11, pp. 355–359*).—The author studied a number of Uredineæ in regard to

their power of scattering spores without the aid of wind, finding that some possess the ability in limited degree.

A new fungus (Cunninghamella bertholletiæ), O. STADEL (*Über einen neuen Pilz Cunninghamella Bertholletiæ. Diss., Kiel, 1911, pp. 35; abs. in Mycol. Centbl., 1 (1912), No. 7–8, pp. 218, 219*).—This paper gives the results of the author's studies with *C. bertholletiæ* n. sp., found on Brazil nuts, including an account of the influence of the chemical and physical factors affecting its growth and fructification. The fungus is said to flourish also on dead seeds of both cherries and almonds, and generally on substrata rich in fatty substance.

Experiments on control of loose smut of barley and wheat with the hot water treatment in 1912, R. SCHANDER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1912), No. 2, pp. 125–136*).—Pursuant to previous work (E. S. R., 28, p. 445), the author gives an account of tests made in treating barley and wheat before planting with one or two soakings in tepid water, followed by immersion in water at from 50 to 53° C. for from 5 to 10 minutes.

The results were practically always favorable as regards a lower percentage of infection of the plants when compared with those from untreated seed, while the percentage of germination was but slightly or not at all affected, except in case of the higher temperatures or longer treatments. Winter wheat steeped for 4 hours at 25° and then dipped into water for 10 minutes at 52° gave a germination of from 98 to 99 per cent and no infection. Summer wheat under similar treatment gave 97 per cent germination and 0.38 per cent infection, while barley gave, respectively, 99 per cent and 0.27 per cent. This seems on the whole the best treatment used. The yield was very little affected by the treatments.

Take-all in wheat (*Agr. Gaz. N. S. Wales, 23 (1912), No. 11, pp. 934–936*).—A brief description is given of this disease of wheat due to the fungus *Ophiobolus graminis*. The author states that in addition to wheat the fungus thrives on barley grass (*Hordeum murinum*) and spear grass (*Bromus sterilis*), as well as on barley. It is claimed that oats are not subject to the attack of this fungus, and in the methods suggested for treatment the growing of oats and the fallowing of land between crops are recommended.

White heads or take-all of wheat and oats, G. MASSEE (*Roy. Bot. Gard. Kew. Bul. Misc. Inform., 1912, No. 10, pp. 435–439, fig. 1; Jour. Bd. Agr. [London], 19 (1913), No. 12, pp. 1020–1025, pl. 1*).—The author reports on this disease of wheat and oats which is attributed to *Ophiobolus graminis*. The disease exists in two somewhat different forms. In the condition known as white head the plants usually attain their full growth and the heads are of normal size, but the grain is undeveloped or shriveled and worthless. In the second form the plants are attacked at an early stage of growth and become yellow and often die before the stem is formed.

The uncertainty as to the cause of the disease which has existed for so long is attributed to the fact that the fungus generally produces its fruit during the winter months on the stubble and hence escapes observation. The spores liberated during the winter or early spring remain in the soil until the required amount of moisture and temperature induces germination.

Contrary to reports from Australia noted above, the author believes that oats are subject to the attack of this fungus, and that they can not be used in rotation as has been recommended. Soil treatment consisting of the application of superphosphate of lime at the rate of 170 lbs. per acre has given good results, as well as the application of sulphate of iron at the rate of 100 lbs. per acre. The earlier varieties of wheat are said to be most susceptible to the disease, and red wheats least so, but they are not entirely immune. In addition to wheat and oats the fungus attacks numerous wild grasses. A brief technical description is given of the fungus.

Brusone of rice, R. AVERNA-SACCÁ (*Bol. Agr. [São Paulo], 13. ser., 1912, No. 4, pp. 291–302, figs. 10*).—The author, discussing the various fungi and other agencies which have been thought to cause brusone of rice, cites evidence in favor of the view that this disease is due primarily to sudden and repeated changes of temperature. Remedies proposed include (1) care in handling so as not to injure the plants, (2) avoidance of too close planting, (3) choice of resistant varieties of rice, and (4) harvesting the crop in such time and manner as to avoid including the eggs of insects injurious to the rice plants.

Sclerospora disease of rice plants, G. YAMADA (*Abs. in Mycol. Centbl., 1 (1912), No. 9, p. 291*).—The author found in the tissues of rice plants oöspores of *S. macrospora*, the morphological characters of which are discussed. He considers this fungus the cause of the wilt disease of rice which has recently proved somewhat destructive in northern Japan, and which has hitherto been attributed either to *Helminthosporium oryzæ* or to physiological causes..

The action of corrosive sublimate solution in protecting rye against soil Fusarium, L. HILTNER and G. GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 10 (1912), No. 11, pp. 129–131*).—As a result of this preliminary study, the authors hold that steeping rye before planting in a 0.1 per cent solution of mercuric chlorid is protective against attacks from Fusarium when present in the soil, not only to the grain but also to the young plants, and that the yields may be greatly increased thereby. See also previous notes (E. S. R., 27, pp. 351, 445).

The rots of the cotton boll, C. W. EDGERTON (*Louisiana Stas. Bul. 137, pp. 3–113, pls. 13*).—This bulletin is the result of a number of years' study by the author of the various rots due to fungi and bacteria that attack the cotton boll. The most important organisms causing these rots are *Bacterium malvacearum*, *Glomerella gossypii*, and *Diplodia gossypina*.

B. malvacearum produces watery spots on the leaves and bolls, which are later invaded by other rot organisms. Inoculation experiments have shown that this organism can enter the uninjured epidermis of leaves and bolls, the period of incubation on the leaves being from 9 to 16 days. Young bolls were rapidly inoculated with the bacteria by spraying them into the open flowers.

The anthracnose produced by *G. gossypii* is said to cause a greater loss than any other boll rot. In addition to the spots on the bolls, which are followed by a general rot, this fungus produces spots on the cotyledons and a damping off of the young plants. The anthracnose fungus is carried over to the crop through the seed or on the lint attached to the seed, and the spores may live for several months but apparently die in the seed before the second spring after they are picked. Cotton bolls are infected by the anthracnose through wounds, or the mycelium may penetrate the uninjured epidermis. Young bolls may be infected without the intervention of any injury until they are half grown. The spores placed in the open flowers will germinate and infect the young bolls, but there does not seem to be much if any relation between the anthracnose spores in the flowers and the shedding of the young bolls. Some varieties of cotton are much less susceptible to this disease than others.

Black rot of the cotton boll is due to *D. gossypina*, only the pycnidial stage of the fungus being known. It attacks bolls only through wounds, and its spores are very resistant to drying. When once attacked by Diplodia the whole boll is quickly destroyed.

Some injury to cotton bolls is due to a species of Fusarium, which apparently lives over by spores on the seed as well as by mycelium within the seed. The Fusarium only attacks bolls that have been previously weakened by the presence of other boll-rotting organisms.

Among other fungi noted as found on cotton bolls are *Rhinotrichum tenellum*, *Olpitrichum carpophilum*, *Botryosphæria fuliginosa*, etc.

A bibliography is appended.

Anthracnose of lupine, G. Bondar (*Bol. Agr. [São Paulo], 13. ser., 1912, No. 5, pp. 427–432, figs. 2*).—A description is given of a new species of fungus, *Glœosporium lupinus*, which is said to have severely attacked white lupines growing in São Paulo. A note is also given on the attack by *Heterodera radicicola* on lupines.

Recent studies with Phytophthora infestans on potatoes, E. Riehm (*Deut. Landw. Presse, 39 (1912), No. 90, pp. 1045, 1046*).—The author cites experimental evidence tending to show that spores of *P. infestans* may be carried down by soil water to a depth of from 13 to 15 cm.; that tubers of the whiter and thinner skinned varieties are less resistant than those of the red, thicker skinned sorts; and that American potatoes appear more susceptible to this disease than the European. Resistance or susceptibility is not deemed an absolute quality, since it appears to be dependent also upon such external conditions as soil, climate, etc.

The history of potato leaf roll, E. Voges (*Fühling's Landw. Ztg., 61 (1912), No. 16, pp. 542–553*).—This is a brief account of discussions and opinions presented by various authors on leaf roll of potato, consideration of which leads the author to the conclusion that leaf roll may prove to be not a particular disease in the ordinary sense, but that the symptoms grouped under this head may be the results of several different causes.

Wart disease of the potato, G. G. Atwood (*N. Y. Dept. Agr. Bul. 41, 1912, pp. 37–51, pls. 3*).—This is a compilation of information from various sources regarding the wart disease, black scab, canker, cauliflower, potato wart, etc., ascribed to *Chrysophlyctis endobiotica*. Official notice is also given of the prohibition of the importation or planting of potatoes from any of the countries named where the disease is said to be prevalent.

Bruise in potato, A. S. Horne (*Jour. Roy. Hort. Soc. [London], 38 (1912), No. 1, pp. 40–50, pls. 2*).—For a number of years the author has been investigating the cause of the black discoloration of the flesh of potatoes. This trouble seems to have some economic importance, but is not to be confused with the discoloration which often appears after the cut surface of a tuber has been exposed to the air, nor with that which occurs after cooking. He concludes that the disease is found among a large number of varieties of potatoes, and becomes evident somewhat late in the storage period.

Diseased tubers when planted under proper conditions yielded a perfectly healthy crop, so that it appears that the disease is not spread from one tuber to another. In this disease a wound cambium is not formed between diseased and healthy tissue, as in the case of tubers affected with internal streak disease caused by Phytophthora. No organisms have been isolated from the diseased tissue, and it is believed that bruise is fundamentally a physiological trouble.

Absorption of copper fungicides by potatoes (*Jour. Bd. Agr. [London], 19 (1912), No. 9, pp. 751, 752*).—Experiments conducted in Lancashire in 1910 are reported in which different plats were treated with Strawsonite and copper sulphate at the rate of 75 lbs. per acre, the fungicides being applied to the soil as a possible means for preventing wart disease. Subsequently the tubers were analyzed to determine the amount of copper in the peel and in the substance of the tuber.

A considerably greater quantity of copper was found in the peel than in the other portion, but practically no difference was noted between the amount

of copper present in the tubers from the plat receiving copper sulphate and that in the tubers from the untreated plat. The potatoes receiving the Strawsonite contained considerably more copper than those treated with copper sulphate.

In 1912 a similar experiment was conducted at Kew as a check to the previous one, and it was found that the difference previously noted for the two fungicides was not repeated.

Leaf disease of the beet, A. STIFT (*Wiener Landw. Ztg., 62 (1912), No. 94, p. 1085*).—A brief account of some observations made by the author in 1911 and 1912 on leaf diseases of beets ascribed to *Cercospora beticola*, *Ramularia betæ*, *Sporidesmium putrefaciens*, and *Phyllosticta betæ*.

Root disease in the cane fields of Porto Rico, J. R. JOHNSTON (*Porto Rico Prog., 3 (1912), No. 18, pp. 16–18*).—A study made of sugar cane at the Sugar Planters' Station at Rio Piedras showed the presence of the following fungi: *Marasmius sacchari*, a stellate-crystal fungus abundant on dead shoots, diseased roots, and sheaths of good cane; *Asterostroma albido-carneum*, present on dead leaf sheaths; *Corticium* sp., common at the base of the lower leaf sheaths of good and poor cane; and *Hypochnus* sp., on cane trash and on the lower leaf sheaths. Cane on the lowlands is readily infected with these fungi, but on the hill lands only the stellate-crystal fungus has been found in abundance.

The mosaic disease of tobacco, H. A. ALLARD (*Science, n. ser., 36 (1912), No. 938, pp. 875, 876*).—The author reports a study on the mosaic disease of tobacco, which is usually regarded as due to physiological causes but which he maintains is probably caused by the presence of an active living microorganism.

Inoculation experiments have shown the possibility of transferring the disease to a number of genera of solanaceous plants, but so far attempts to inoculate the common potato, eggplant, and belladonna, as well as *Nicotiana glauca* and *N. viscosum*, have failed. Attention is called to the character of the flowers of plants affected by the disease, and their distinctive appearance is said to be a positive method for determining the presence of the mosaic disease in tobacco. The investigations, which have not yet been concluded, seem to indicate that infectious mosaic is carried from plant to plant by aphids.

On the life history and cytology of a new Olpidium, S. KUSANO (*Jour. Col. Agr. Imp. Univ. Tokyo, 4 (1912), No. 3, pp. 141–199, pls. 3, fig. 1*).—The author gives an account of the life history and cytology of a fungus parasite on vetch in Japan. The species, being apparently a new one, is described as *O. viciæ* n. sp. The fungus attacks the epidermal cells of leaves and stems, causing the leaf to remain a light-greenish color and producing a hypertrophied condition of the diseased spots.

The principal portion of the paper is taken up with a cytological study of the species with special reference to the zoospores and their copulation.

Sclerotinia of cherries, J. WESTERDIJK (*Meded. Phytopath. Lab. Willie Commelin Scholten, 1912, No. 3, pp. 39–41, figs. 3; abs. in Mycol. Centbl., 1 (1912), No. 11, p. 372*).—This is a brief account of the discovery of apothecia of the Sclerotinia found on cherry trees, with measurements of spores and asci parallel with those of closely related forms found on plums and peaches. Examination of conidia is still lacking to complete the description of this form.

Experiments in the control of grape anthracnose, L. A. HAWKINS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 105, pp. 8, pls. 2*).—The author briefly describes experiments for the control of grape anthracnose, or bird's-eye rot, caused by *Sphaceloma ampelinum*. This disease is said to be of considerable

importance on certain varieties of grapes grown in the eastern United States, particularly the varieties Vergennes, Salem, Diamond, Norton, Missouri Riesling, Diogenes, and Champion.

The experiments reported were conducted in Michigan on a vineyard of Champion grapes, the vines being sprayed when dormant in 1910 and treated with various fungicides in 1911 and 1912. Iron sulphate, sulphuric acid, Bordeaux mixture, and lime-sulphur solutions were all tested, and seemed about equal in efficiency. For commercial purposes, when the ease of preparing a mixture is considered, concentrated lime-sulphur is believed to be the most easily prepared and readily applied.

In attempting to control this trouble the diseased wood should be pruned out and the vines treated when dormant. Sprayings with Bordeaux mixture should follow the winter spraying.

Grape crown gall investigations, F. GARCIA and J. W. RIGNEY (*New Mexico Sta. Bul. 85, pp. 28, figs. 3*).—This investigation was begun in 1903 and carried on later in cooperation with the Bureau of Plant Industry of this Department, a technical paper on which has been noted elsewhere (E. S. R., 23, p. 650).

Subsequent to the original investigation the authors carried on experiments with reference to determining resistant varieties. Although the Vinifera grape was found quite susceptible to crown gall, the degree of susceptibility varied widely for the different varieties. Out of 83 varieties tested 16.86 per cent were entirely free from crown gall, and of the others many were only slightly injured by the attack.

In propagating grapes the authors state that cuttings should be made from vines that are in no way affected by the disease, as there appears to be evidence of its transmission in this manner.

Gummosis and roncet of grapevines in Algeria, L. TRABUT (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 51, pp. 781–783*).—This is a brief discussion of the occurrence of gummosis in Algeria, the question as to whether its character is pathological or physiological, the experiments bearing upon its possible relation to roncet, and the necessity of selecting only sound material for grafts or stocks.

Characters of arricciamento and mosaic disease of grapevines, E. PANTANELLI (*Malpighia, 24 (1912), No. 5–6, pp. 497–523, pls. 8; 25 (1912), No. 1, pp. 17–46*).—In addition to a brief notice of the contributions of others, of which a bibliography is given, on the characteristic alterations exhibited by roncet, mosaic disease, or arricciamento of grapevines, the author gives the results of his own study on the characters of arricciamento, or frizzle disease, and on the characters of this form of disease when complicated with the others, also as to the varieties most frequently showing a given form or complication.

American gooseberry mildew, H. C. LONG (*Gard. Chron., 3. ser., 52 (1912), No. 1354, p. 421, pl. 1*).—A description is given of the gooseberry mildew, due to *Sphærotheca mors-uvæ*. This is said to have made its appearance in Europe about 1900, since which time it has spread widely and caused considerable loss. The varying susceptibility of different varieties of gooseberries to this fungus is indicated, the slow-growing varieties being less subject to attack than the more rapid-growing ones, and those with soft-skinned berries being especially liable to suffer from its attack. Ripe berries of any variety are very liable to destruction by the fungus.

Autumn treatment, consisting of the cutting out and removing of all infected shoots, is recommended, the prunings to be burned as soon as cut. In addition, ordinary sanitary measures and proper management, together with spraying with copper sulphate solution early in the season and with potassium sulphid

later, are recommended. The author states that nitrogenous manures should be sparingly used.

Citrus galls, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 1 (1912), No 13, pp. 937–940, figs. 4*).—A brief account is given of galls produced on various species of citrus trees by the organism *Bacterium tumefaciens*.

Gummosis of orange trees and its treatment, M. S. BERTONI (*Agronomía [Puerto Bertoni] 5 (1911), No. 2, pp. 77–89*).—A discussion is given of the four typical stages of the disease attacking orange trees, preferably the trunk near the root, and characterized by the exudation of a thickening gum favoring insect work and the production finally of an open wound extending both upward and downward. It is denied that the disease is caused by a parasite, as *Bacillus gummificans*. Proper enrichment and sanitation of the soil is recommended as a preventive and remedial treatment.

Melanose and stem-end rot, B. F. FLOYD and H. E. STEVENS (*Florida Sta. Bul. 111, pp. 16, figs. 9*).—The investigations of the authors, working independently, have established the fact that the organism, *Phomopsis citri*, previously described as causing the stem-end rot (E. S. R., 26, p. 449), is also responsible for the disease known as melanose. The amount of damage done by the two different diseases varies decidedly, melanose usually causing only a superficial marking on the fruit, while the stem-end rot destroys the matured or nearly matured fruit in the grove, in storage, and in transit. Nearly all varieties of citrus fruits are subject to attacks of the fungus, and thus far no species or varieties have been found that are particularly immune. Comparisons are drawn between these and other diseases of citrus fruits, the organism causing the diseases is described, and the results are given of inoculation experiments.

For the control of the diseases pruning out dead wood, spraying with Bordeaux mixture or ammoniacal copper carbonate, collection of all infected fruit, and care in handling are recommended.

A serious disease of coffee trees, R. RAMIREZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 1 (1912), No. 4, pp. 301–303, pls. 3*).—This is a brief description of a disease of coffee trees which recently appeared in the State of Oaxaca, due to a fungus the classification of which is yet uncertain, but which threatens the ruin of the coffee plantations of that vicinity. The mycelium penetrates deeply into the wood, which is variously discolored, while the bark shows discolored wounds. No curative treatment is yet known, but spraying with fungicides is recommended as a preventive measure.

The relationships of the chestnut-blight fungus, G. P. CLINTON (*Science, n. ser., 36 (1912), No. 939, pp. 907–914*).—The author discusses at some length the systematic relations of the fungus causing the blight of the chestnut.

This fungus has usually been referred to as *Diaporthe parasitica*, but according to the author's investigations it should be referred to the genus Endothia, three species of which are recognized. *E. radicalis*, a linear-spored form, is said to be probably the one most common in American herbaria. The second form, characterized by narrowly-oval spores, is referred to *E. gyrosa*, which is said to be the same as the nonparasitic form recently described by Anderson (E. S. R., 28, p. 551). The third form, which has broadly-oval spores and is the true chestnut blight of the northeastern United States, is called *E. gyrosa parasitica*. This variety is distributed from New Hampshire to Virginia, and is known to occur on several species of chestnuts as well as on the oak, though rarely on the latter. It is thought to be the most northern of the forms occurring and has not yet been recognized outside of the United States.

The wintering of the oak mildew, N. VAN POETEREN (*Tijdschr. Plantenziekten, 18 (1912), No. 4, pp. 85–95; rev. in Bul. Soc. Cent. Forest. Belg., 19*

(*1912*), *No. 12, pp. 750–759*).—From a study of the oak mildew the author concludes that in Europe it winters over beneath the bud scales and appears in the spring on the young shoots. From these the conidia soon spread the fungus to the later unaffected leaves.

A new fungus on leaves of Platanus, H. EDDELBÜTTEL and J. ENGELKE (*Mycol. Centbl., 1 (1912), No. 9, pp. 274–277, figs. 6*).—The authors found in leaves of *P. occidentalis* at Göttingen a fungus said not to correspond to any previous description of Microstroma, and described under the name *M. platani* n. sp.

Leaf cast of Scotch pine, J. VOGL (*Forstw. Centbl., n. ser., 33 (1911), No. 12, pp. 621–631; abs. in Mycol. Centbl., 1 (1912), No. 11, p. 370*).—The author states that needle cast of young pines, due to *Lophodermium pinastri*, is favored by cold winters, either damp or with little snow; early or late frosts; sunshiny days with frozen ground in spring; and poverty of soil. The author recommends the setting out of plants from two to three years old only, artificial manures on limited areas, employment of northern seed, and spraying all the year round with Bordeaux mixture.

Pea disease in rubber trees (*India-Rubber Jour., 44 (1912), No. 23, p. 23, fig. 1*).—A description is given of an unsual appearance of trees following improper tapping in which the cambium is penetrated.

The exposed surface develops uneven pea-like structures from which the name is derived. These first show a slight elevation in the bark, have a hard woody structure, and through the coalescence of a number may produce solid knots, interfering with subsequent tapping. This occurrence is reported not only on Hevea but also on Ceara trees, and is sometimes noted on trees that have not yet been tapped. Similar structures have been reported as occurring on other trees, but no definite explanation has been given regarding their cause.

Lime-sulphur wash, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 49, pp. 716, 717*).—The author experimented with a mixture of 3 parts of powdered sulphur and 2 of quick-lime to 100 of water, applied March 25, May 5, and July 8 to peach, apricot, plum, pear, and almond trees, and to strawberry plants.

It was found that, while no uniformly protective influence was exerted against the brown rust of peach trees, the treatment was materially protective to all the others tested. It was thought that an early application might increase results by prevention. The foliage was not affected in any characteristic manner by the spray employed.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Report on rodent investigations for 1912, W. L. BURNETT (*Off. State Ent. Colo. Circ. 6, 1912, pp. 20, figs. 9*).—This report deals largely with the distribution of and injury caused by prairie dogs and ground squirrels in Colorado. Three species of prairie dogs and 9 species and subspecies of ground squirrels occur in the State, namely, the plains prairie dog (*Cynomys ludovicianus*), Gunnison prairie dog (*C. gunnisoni*), white-tailed prairie dog (*C. leucurus*), the Wyoming spermophile (*Citellus elegans*), large spotted spermophile (*C. spilosoma major*), Kennicott's spermophile (*C. obsoletus*), striped spermophile (*C. tridecemlineatus pallidus*), little striped spermophile (*C. tridecemlineatus parvus*), rock squirrel (*C. variegatus grammurus*), antelope squirrel (*Ammospermophilus leucurus cinnamomeus*), Say's ground squirrel (*Callospermophilus lateralis*), and Wortman's ground squirrel (*C. wortmani*).

The plains prairie dog is said to be the worst pest on account of its general distribution throughout the arid portions of the State. It is stated that the results obtained from the use of Pintsch oil in combating the prairie dog have been very satisfactory, 85 per cent having been killed when used at the rate of 2 tablespoonfuls to each burrow.

[Injury of standing grain by mice], W. EDLER (*Fühling's Landw. Ztg., 61 (1912), No. 15, pp. 512–514*).—The author cites damages done by mice in parts of the German Empire and discusses remedies.

Fourteenth report of the state entomologist of Minnesota, F. L. WASHBURN (*Rpt. State Ent. Minn., 14 (1911–12), pp. XIII+114, pls. 3, figs. 73*).—The first part of this report deals with the work with grasshoppers in 1911 and 1912, an account of which for 1911 has been previously noted (E. S. R., 28, p. 59).

The author found that the most successful control method consists in the application of arsenite of soda 3 lbs., molasses 1½ gal., and water 180 gal. as a spray, which, when applied at the rate of 50 gal. to the acre at a cost of about 30 cts. for material, proved fatal to the grasshoppers and did not in any way injure the crops. While from 24 to 28 hours are required to kill the grasshoppers, they are practically paralyzed immediately after feeding upon the poison and eat little or nothing thereafter. The importance of cooperation among farmers of a neighborhood in combating grasshoppers is emphasized. It is stated that the abundance of rain in May and early June prevented a plague of grasshoppers in 1912.

To the list of 81 species of Orthoptera, previously known to occur in Minnesota, 11 were added during 1912. Part of a report by M. P. Somes of field work in 1911 with grasshoppers is incorporated, as are observations made in 1912 by C. W. Howard. An account of the enemies of grasshoppers is included.

Brief accounts are also given of blister beetles; the wheat stem maggot; cutworms; white grubs; the clover seed chalcid; some shade tree pests, namely, the 2-lined chestnut borer, bronze birch borer, elm borer, common flat-headed borer, rustic borer, and thunderbolt beetle; the larch sawfly; the campaign against the house fly; orchard spraying in 1911 and 1912; corn bill bug; a few household insects; and mice and rabbits.

The report concludes with a discussion of inspection of Minnesota nurseries and of imported stock, and recent federal legislation affecting nurserymen.

Department of entomology, C. E. SANBORN (*Oklahoma Sta. Rpt. 1912, pp. 27–30*).—A brief account of the status and work of the year, including notes on the San José scale, shot-hole borer, cowpea plant louse, alfalfa webworm, chinch bug, and corn plant louse.

Injurious insects and other animals observed in Ireland during the year 1911, G. H. CARPENTER (*Econ. Proc. Roy. Dublin Soc., 2 (1912), No. 5, pp. 53–78, pls. 2, figs. 13*).—This is the author's annual report on the more important insects of the year.

The control of insect pests in Canada, C. G. HEWITT (*Canada Expt. Farms Bul. 9, 2. ser., 1912, pp. 13*).—This is an address delivered by the author in January, 1912, before the Literary and Philosophical Society of Manchester, England. It summarizes briefly the history and progress of the work in connection with the study and control of insect pests in Canada from 1863 to the present time.

[Aphis avenæ and Crioceris melanopa injuring cereals in Roumania] (*Câmpul, 1912, No. 6, pp. 172, 173; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2109*).—These pests have been the source of injury in Roumania; *A. avenæ* by attacking oats, rye, barley, and spring wheat, and the larvæ of *C. melanopa* through attacking the leaves of barley and oats.

Notes on insects injurious to cotton in South Africa, W. Moore (*Agr. Jour. Union So. Africa, 4 (1912), No. 5, pp. 714-720, figs. 8*).—It is stated that the injury to cotton in South Africa, where considerable attention has been given to its cultivation during the past few years, has been as high as 75 per cent or more. This paper presents the results of observations made during the past season at Potchefstroom. In addition to the spiny cotton bollworm (*Earias insulana*), which has been the most important pest, the author mentions the common cotton bollworm, cotton stainer (*Dysdercus nigrofasciatus*), dusky cotton bug (*Oxycarenus lætus*), cotton scale (*Pulvinaria jacksoni*), cotton aphis, cotton leaf roller (*Sylepta derogata*), green stink bug (*Nezara viridula*), and the black and red stink bug (*Atelocera strictica*).

The animal enemies of the sugar beet, J. Jablonowski (*Die tierischen Feinde der Zuckerrübe. Budapest, 1909, pp. 399, figs. 75*).—A German translation of the work previously noted (E. S. R., 18, p. 60).

Tomato insects, root knot, and "white mold," J. R. Watson (*Florida Sta. Bul. 112, pp. 21–39, figs. 14*).—This bulletin contains brief popular accounts of the bollworm or tomato fruit worm, which is the most serious pest of the tomato in Florida; thrips (*Euthrips tritici*), which occasionally are the source of injury to tomatoes; cutworms; tobacco worm; tomato worm; tomato aphis (*Megoura solani*); flea beetles; and several miscellaneous insects, including blister beetles (*Epicauta* spp.), white-lined morning sphinx (*Celerio lineata*), semitropical army worm (*Prodenia eridania*), grasshoppers, suck fly (*Dicyphus minimus*), white fly of tomato (*Aleurodes tabaci*), etc., with notes on their biology, and preventive and remedial measures. A brief account is also given of the nematode *Heterodera radicicola* and white mold (*Eriophyes calacladophora*).

Insect enemies of osiers in Belgium, J. Poskin (*Ann. Sta. Agron. Gembloux, 1912, pp. 215–270*).—This paper deals with the more important insect enemies of osiers in Belgium. A list is given of 58 species which are the source of considerable injury to willows (Salix).

Insects and spiders in Spanish moss, A. H. Rosenfeld (*Jour. Econ. Ent., 4 (1911), No. 4, pp. 398–409; 5 (1912), No. 4, pp. 338, 339*).—This lists the species and approximate number found hibernating in *Tillandsia usneoides* in Louisiana.

Notes on Syntomaspis druparum and Ichneumon nigricornis, C. R. Crosby (*Canad. Ent., 44 (1912), No. 12, pp. 365, 366*).—These notes are supplementary to information published in a bulletin previously noted (E. S. R., 21, p. 351).

Collembola damaging tobacco seed beds (Isotomurus palustris maculatus), A. Splendore (*Bol. Tec. Coltiv. Tabacchi [Scafati], 11 (1912), No. 3, pp. 147–151, fig. 1; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2110, 2111*).—This springtail is said to have invaded tobacco seed beds at Scafati, Italy, and injured the recently germinated plants before the small leaves were put out, the plants being found in the morning with the slender stems pulled down toward the ground or more frequently cut off, and sometimes with the cotyledons nibbled. The insect was successfully controlled by means of carbolic tobacco extract in a strength of 0.5 per cent and by strewing tobacco insecticide powder or ashes.

The cultivation of lac in the plains of India (Tachardia lacca), C. S. Misra (*Agr. Research Inst. Pusa Bul. 28, 1912, pp. 32, pls. 3, figs. 18*).—This bulletin, based upon 6 years' work by the author, is intended for students, inquirers, and those wishing practical instruction in starting in this industry.

Preliminary studies on the biology of the bedbug, Cimex lectularius. II. Facts obtained concerning the duration of its different stages, A. A. Girault (*Jour. Econ. Biol., 7 (1912), No. 4, pp. 163–188*).—This second paper (E. S. R., 24, p. 259) deals with observations on the duration of the different stages of *C. lectularius*.

The development of the parasite of Indian kala-azar, W. S. PATTON (*Sci. Mem. Med. and Sanit. Depts. India, n. ser., 1912, No. 53, pp. 38, pl. 1*).—The author first reviews previous work on the subject, including feeding experiments with blood-sucking insects, and then reports at length on the development of *Herpetomonas donovani* in *Cimex rotundatus* and in *C. lectularius*, its behavior in the reduviid bug *Conorrhinus rubrofasciatus*, its biological position, and the prevalence of kala-azar in India.

The observations here reported lead the author to conclude that *C. rotundatus* and *C. lectularius* are the true invertebrate hosts of the kala-azar parasite. He states that there is at present no proof that either the parasite of kala-azar or that of oriental sore will flagellate in any insect other than their true invertebrate host, and that he is able further to show that the parasite of kala-azar will not flagellate in the stomach of an insect which ingests suitable pabulum rich in blood.

The seventeen-year cicada on Staten Island between the years 1894 and 1911, W. T. DAVIS (*Proc. Staten Isl. Assoc. Arts and Sci., 3 (1911), No. 3, pp. 120–122*).—A summarized account of the occurrence of this insect on Staten Island.

A threatened native pest of oranges, W. W. FROGGATT (*Agr. Gaz. N. S. Wales, 23 (1912), No. 12, p. 1079*).—*Psylla schizoncuroides*, common in all the western part of New South Wales upon the wild caper bush (*Capparis mitchelli*), is said to be a source of injury to orange trees at Dubbo.

An insect pest of the "Currajong" (Brachychiton), C. FRENCH, Jr. (*Jour. Dept. Agr. Victoria, 10 (1912), No. 11, pp. 662, 663, figs. 7*).—The psyllid *Tyora sterculiæ*, which is often mistaken for an aphid, is said to discolor the leaves of the large evergreen shade tree *Brachychiton populneum*, cultivated in Victoria.

Contribution to the knowledge of the alternation of generations of some aphids, I. KLODNITSKI (*Zool. Jahrb., Abt. System., Geogr. u. Biol. Tiere, 33 (1912), No. 5, pp. 445–520, figs. 3*).—The aphids here considered are *Siphonophora rosæ*, *Aphis hederæ*, *A. salicti*, *Chætophorus testudinatus*, and *C. aceris*.

Some morphological and biological observations of Forda formicaria, D. LOMBARDI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), I, No. 12, pp. 809–814; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2108*).—This plant louse is reported to have been the source of injury in the vicinity of Rome to wheat, oats, and grasses of the genus Poa. It always attacks the plant at about the level of the ground and is never found on the parts above ground. It is frequently associated with other aphids, namely, *Tetraneura ulmi*, *Pemphigus lactucarius*, and *Pentaphis* (*Tychea*) *trivialis*. The author thinks that the sexual generation may find shelter in ant hills, when the latter are in the vicinity of the infected plants. An unidentified fungus is said to destroy this aphid in great numbers.

The life history of Panorpa klugi, T. MIYAKÉ (*Jour. Col. Agr. Imp. Univ. Tokyo, 4 (1912), No. 2, pp. 117–139, pls. 2*).—A detailed account of the life history and habits of this mecopteron.

Mimicry in boreal American Rhopalocera, H. SKINNER (*Jour. Acad. Nat. Sci. Phila., 2. ser., 15 (1912), pp. 119–127*).—The author at the present time takes the view that there is not enough evidence to substantiate the hypothesis of mimicry in North American butterflies.

The dispersion of the gipsy moth, A. F. BURGESS (*U. S. Dept. Agr., Bur. Ent. Bul. 119, pt. 6, pls. 17, figs. 6*).—This bulletin presents the results of

extensive studies made to determine the means by which the gipsy moth is spread.

"Local spread may be due to the transportation of caterpillars or egg clusters on carriages or wagons that move for only a short distance outside the infested territory. The egg clusters may be carried on driftwood which floats down rivers during the spring. Long-distance spread may be due to the shipment of egg clusters on lumber products, nursery stock, or boxes from the infested territory to any points where such goods are unloaded. Caterpillars may be, and often are, carried long distances on automobiles or trolley cars, and cases are on record where colonies have been established in this way." The author concludes that the evidence is wholly inadequate to prove that birds are responsible for distributing the gipsy moth to the large area which has annually become infested.

Experimental work with larvæ to determine their spread by the wind, a preliminary account of which by Rane has been previously noted (E. S. R., 25, p. 257), is described in detail. The experiments indicate that the best opportunity for the dispersion of gipsy-moth caterpillars by the wind is when the temperature is above 65° F. and the velocity of the wind over 15 miles an hour. The experiments show that young larvæ of this insect can be carried by wind a third of a mile from a point less than 6 ft. above the ground.

The author discusses the quantity of silk produced by first-stage gipsy-moth larvæ, relation of temperature to hatching of eggs, effect of temperature on activity of larvæ, relation of activity to the spinning of silk, locations where egg clusters are deposited, distance first-stage larvæ can crawl, degree of infestation, kinds and condition of food plants, and direction and velocity of the wind. It is shown that the spread has been along the lines of prevailing winds to so great an extent that the evidence is conclusive that the natural spread is accomplished chiefly in this way, all of the records bearing out this conclusion. Records secured from the reports of scouting in several selected towns and cities of the dispersion of the gipsy moth follow. It is pointed out that the character of the food has a very important bearing on the dispersion of this insect since unless caterpillars blown by the wind are able to find lodgement on favorable plants they will not survive and there will be no opportunity for the species to become established.

The author recommends that national legislation be enacted to provide for the inspection of lumber products or other material which is likely to carry the gipsy moth from the territory now infested to uninfested regions.

Papers on insects affecting vegetables.—The horse-radish webworm (Plutella armoracia), H. O. Marsh (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 7, pp. 71–76, figs. 4*).—A brief account is here given of the life history and habits, natural enemies, and remedial measures of the yponomeutid webworm *P. armoracia*, a new and hitherto unrecorded truck-crop pest which came under the author's observation at Rocky Ford, Colo., infestation apparently being restricted to about 15 "clumps" of horse-radish plants in one garden.

The eggs are usually deposited singly on the upper or lower sides of the leaves. Upon hatching out the young webworms spin compact webs under which they rest and feed until mature. When the horse-radish plants are young, the larvæ web together and feed on the first spikelike leaves and later among the blossom buds. With older plants the larvæ feed on the leaves generally, usually selecting the most tender ones. Their most noticeable injury is said to be due to checking the first growth of the plants early in the spring and destroying the blossom buds. The cocoons are placed on leaf petioles or among dead leaves.

There are 4 generations each year and activity is continuous from the last days of March until well into October. While a few of the larvæ of the fourth generation mature and produce moths in late September or October, the majority live through the winter among dead leaves or in cracks in the soil, and develop into moths the following April. It was found that the larval stage of the fourth generation may vary from 27 days to 6 months. A total of 331 eggs was deposited from May 4 to May 30 by one female kept under observation in a cage.

A parasite described by Viereck as *Angitia plutellæ* n. sp. was found to prey on this species at Rocky Ford. Experiments indicate that this insect can not be controlled with arsenicals, but it is pointed out that if artificial control measures should become necessary, much could be accomplished by burning the dead horse-radish leaves and petioles during the winter, followed by cultivation of the soil about the roots.

Directions for the cultivation of eri silk, T. B. FLETCHER (*Agr. Research Inst. Pusa Bul. 29, 1912, pp. 19, figs. 8*).—A brief practical manual.

Observations on the identity of the wheat midge, E. P. FELT (*Jour. Econ. Ent., 5 (1912), No. 3, pp. 286–289*).—The author states that the evidence at hand is not sufficient to permit a positive opinion as to whether one of the species here described, namely, *Thecodiplosis mosellana*, *Prodiplosis fitchii* n. sp., and *Itonida tritici* n. sp., or some other form is the destructive wheat midge referred to so frequently in earlier economic literature.

A new species of Tachinidæ from Porto Rico, W. R. WALTON (*Proc. Ent. Soc. Wash., 14 (1912), No. 4, pp. 198–200, pl. 1*).—A tachinid reared from the sugar cane May beetle (probably *Lachnosterna crenatocollis*) at Anasco, Porto Rico, has been found to be new to science and is described under the name *Cryptomeigenia aurifacies*.

Information on Ceratitis capitata, R. AVERNA-SACCÁ (*Bol. Agr. [São Paulo] 13. ser., 1912, No. 5, pp. 391–402, figs. 9*).—A brief summarized account of this fruit fly.

[The pepper weevil], G. MALPICA (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 35, 1912, pp. 1–24*).—This paper relates to *Anthonomus eugenii* and its injury to chili peppers (*Capsicum annum*) in Mexico, accounts of which have been previously noted (E. S. R., 17, p. 1092; 19, p. 353). Particular attention is given to practical methods of controlling it.

Technical papers on miscellaneous forest insects.—VI, Chalcidids injurious to forest-tree seeds, S. A. ROHWER (*U. S. Dept. Agr., Bur. Ent. Bul. 20, pt. 6, tech. ser., pp. 157–163*).—This is a résumé of the literature relating to chalcidids injurious to forest-tree seeds. At present phytophagous species are known to occur in the subfamilies Collimaninæ and Megastigminæ, and in the family Eurytomidæ (the phytophagous species being in the tribes Isosomini and Eurytomini) and in addition certain genera which have been assigned to the family Perilampidæ. Seven species of chalcidids are thus far known to attack the seeds of forest trees.

A bibliography of 20 titles relating to the subject is appended.

Papers on deciduous fruit insects and insecticides.—The cherry fruit sawfly (Hoplocampa cookei), S. W. FOSTER (*U. S. Dept. Agr., Bur. Ent. Bul. 116, pt. 3, pp. 73–79, pls. 2, figs. 2*).—Cherries infested by sawfly larvæ were first observed by the author on April 20, 1909, while inspecting a cherry orchard at Suisun, Cal. Although the cherry crop was light the injury was quite general, and further search on April 25 showed the larvæ to be present in greater or less numbers in most of the cherry orchards of the Suisun Valley. A large series of counts made of the fruit in the orchard, in which the pest was

first observed, showed approximately 80 per cent of the fruit to have been injured, most of the larvæ being by this time full grown, and some had evidently finished feeding and left the fruit. In June, 1912, cherries infested by this pest were received from Oregon, where it had been observed in a few orchards in one locality in Jackson County, and was attacking prunes as well as cherries. This is said to be the only record of its occurrence outside of California.

In 1910 the first female sawflies to appear were observed on March 10 in cages planted under trees in the orchard. Adults of both sexes became abundant by March 20, as many as 40 individuals being observed in one tree. Egg laying had begun only sparingly on March 21, but by the afternoon of March 23 many eggs were found. Oviposition was at its height from March 23 to 30 and was practically over by April 5, the adults having mostly disappeared by this time. The females oviposit quite freely in the orchards, always on blossoms just about ready to spread the petals. The greater number of eggs are deposited in the sepals of the flower, although some are deposited in the upper portion of the calyx cup. Eggs deposited March 21 had all hatched by or during the fourth day following.

Upon hatching, the young larva may feed for a short time in the tissue immediately surrounding the egg cavity, or on the inner surface of the calyx cup, but it soon finds its way to the bottom of the calyx cup and eats directly into the newly formed cherry. When full-grown the larva leaves the fruit and works its way into the ground, where it constructs a small parchment-like cocoon from 3 to 7 in. below the surface, the depth varying somewhat with the texture of the soil. The larva remains as such in the cocoon until some time after the winter rains begin, when it transforms to pupa and emerges the following March as an adult.

Two parasites, an ichneumon and a microbracon (*Microbracon* sp.), were reared from collected material.

Experiments in spraying with arsenate of lead were made in 1910, but the poison did not prove to be altogether effective, although satisfactory results are said to have been obtained in its use in the Rogue River Valley of Oregon. Spraying with 3 per cent distillate-oil emulsion to which sulphate of nicotin, at the rate of 1 part to 2,000 parts of water, had been added resulted in the killing of many adults in the early mornings. The cultivation of the land throughly 2 or 3 times just prior to the first picking of the Black Tartarian cherries is said to be highly advisable as most of the larvæ leave the trees at this time and large numbers of them would probably be killed.

The large larch sawfly (Nematus erichsonii), with an account of its parasites, other natural enemies, and means of control, C. G. HEWITT (*Canada Expt. Farms Bul. 10, 2. ser., 1912, pp. 42, pls. 4, figs. 17*).—A detailed account of the biology, economic importance, natural enemies, and preventive and remedial measures for this enemy of larch. An extended account of this pest by the author has been previously noted (E. S. R., 20, p. 1152).

Leaf anomalies of the Melastomaceæ produced by a Tylenchus, H. Ross (*Ber. Deut. Bot. Gesell., 30 (1912), No. 6, pp. 346–361, figs. 8; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2111, 2112*).—The leaves of *Conostegia subhirsuta* were observed by the author while in the State of Vera Cruz to present characteristic deformities which were apparently caused by a nematode of the genus Tylenchus.

Papers on deciduous fruit insects and insecticides.—Lime-sulphur as a stomach poison for insects, E. W. SCOTT and E. H. SIEGLER (*U. S. Dept. Agr., Bur. Ent. Bul. 116, pt. 4, pp. 81–90, pl. 1*).—This paper reports the results of

experiments conducted during 1912 at Benton Harbor, Mich., with lime-sulphur and arsenate of lead, separately and in combination. The experiments, 7 in number, were carried on largely with the fall webworm, the pear slug (*Eriocampoides cerasi*) however having been used in one experiment.

The conclusions drawn by the author from these experiments are as follows: "The foregoing tests of lime-sulphur wash against the larvæ of the fall webworm show that this preparation has decided value as a stomach poison. It is considered extremely probable that caterpillars of many species of insects, and perhaps mandibulate insects in general, will be similarly susceptible. As shown by the data given, lime-sulphur, 1½:50, while slower in killing effect than arsenate of lead, 2:50, nevertheless compares favorably with this strength of arsenical. A comparison, however, of leaf-areas eaten by larvæ subjected to lime-sulphur and arsenate of lead, respectively, shows that the lime-sulphur, especially at increased strengths, compares quite favorably with the arsenical in reducing feeding by the caterpillars.

"This action of lime-sulphur as a stomach poison probably accounts for the reported practical control of the codling moth in orchards treated with lime-sulphur alone, and furnishes an additional reason for its employment as a fungicide.

"Experiments in progress by the Bureau of Entomology during the past 2 years warrant the statement that entirely satisfactory results in controlling the codling moth in orchards may be obtained with lime-sulphur wash combined with reduced strengths of arsenate of lead."

FOODS—HUMAN NUTRITION.

Preserved meats, G. Blanc (*Rev. Serv. Intend. Mil.* [*Paris*], *24* (*1911*), *Mar., pp. 198–204; abs. in Bul. Soc. Sci. Hyg. Aliment., 1* (*1911*), *No. 5–6, pp. 708, 709*).—A discussion of the use of meat in the French army.

Meat, the author points out, requires special preparation for use in the army, and preserved meats, if not used, must be replaced after about 5 years because, even though bacterial action be inhibited, hydrolysis causes separation of the fats into fatty acids and glycerin and of the proteins into albumoses, propeptones, and peptones. The energy obtained from meat is much more expensive than that obtained from bread.

On the discolored spots sometimes present on chilled beef, with special reference to "black spot," G. Massee (*Jour. Hyg.* [*Cambridge*], *12* (*1912*), *No. 4, pp. 489–496, pls. 2*).—The variously colored patches appearing on the surface of chilled beef, the author states, are caused by fungi.

"Amongst these, *Cladosporium herbarum*, producing black spots, is the only fungus that has become specially adapted for flourishing on such an unusual substratum, and may in consequence be expected to continue and even increase in quantity on its new matrix, unless stringent measures are adopted. This fungus is not pathogenic, and the only effect caused by its presence is the unsightly appearance of the meat and consequent deterioration in value. If extensive, the meat may be rendered unsalable.

"The beef is infected with the 'black spot' fungus before it is shipped, and to arrest the continuance of this infection special measures should be taken with the object of exterminating the fungus, which in its specialized form can only occur in the vicinity of the establishment where meat is prepared for shipment."

Fish in the food of the soldier, Rimbert (*Rev. Serv. Intend. Mil.* [*Paris*], *23* (*1910*), *Dec., pp. 1068–1078; 24* (*1911*), *Feb., pp. 141–162; abs. in Bul. Soc.*

Sci. Hyg. Aliment., 1 (1911) No. 5–6, pp. 707, 708).—The author considers the subject from an administrative point of view.

Previous experiments have shown that the ration is too costly and that poor cooking frequently spoils it. Fresh fish is used by the army in the coast districts to a considerable extent, however.

Contribution to the study of the use of fish in the army, WAGNER (*Rev. Serv. Intend. Mil [Paris], 23 (1910), Dec., pp. 1079–1083; abs. in Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, pp. 707, 708*).—The author discusses the use of fish in the army from a scientific standpoint, and concludes that it may be used instead of meat, but that at least 420 gm. for a day's ration must be given and that 35 gm. of fat are needed to make the energy value of the diet sufficient.

Comparative studies of the effect of pancreas diastase upon oat and wheat starch, Y. NAGAO (*Ztschr. Expt. Path. u. Ther., 9 (1911), No. 2, pp. 227–237, pl. 1; abs. in Hyg. Rundschau, 22 (1912), No. 21, p. 1389*).—From the experiments reported the conclusion drawn is that oat starch is more easily attacked by the digestive mixture used than wheat starch.

Analyses of wheats and flours, J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1911–12, pp. 78–83*).—A number of analyses are reported.

Boiled water in bread making, A. BOUTROUX (*Rev. Serv. Intend. Mil. [Paris], 24 (1911), Sept., pp. 867–869; abs. in Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, p. 709*).—The use of boiled water in making bread is found by the author to be without bad effect, and in some cases, especially in the army, it is a useful precaution against bacterial infection.

The use of boiled water in the making of bread, CHAYROU (*Rev. Serv. Intend. Mil. [Paris], 24 (1911), Oct., pp. 938–953; abs. in Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, p. 709*).—Essentially the same conclusions were reached as noted in the preceding abstract.

The anatomical structure of a number of imported legumes commonly found in commerce, M. KONDO (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 1, pp. 1–56, figs. 40*).—Soy beans, cowpeas, lablab beans, chick peas, and other legumes were included in this histological study. The text is supplemented by numerous illustrations.

How to use Hawaiian fruit and food products, AGNES B. ALEXANDER (*Honolulu, 1912, pp. 73*).—Recipes are given for the use of the avocado or alligator pear, banana, breadfruit, coconut, guava, mango, taro, and other fruits and fruit products common in Hawaii. In connection with a suggested menu, directions are given for the preparation of Hawaiian dishes.

Canned fruits and vegetables—home and commercial canneries, J. S. MAGEE (*Texas Dept. Agr. Bul. 26, 1912, pp. 18*).—Directions, including recipes, are given for canning and preserving under home and commercial conditions.

Use of residue from the manufacture of preserved tomatoes, G. ROVESTI (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, pp. 585–588*).—According to the author an oil which may be used in foods can be expressed from the seeds, and the cake is a valuable food for cattle and poultry. The skins may be of use in the manufacture of wrapping paper.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Buls., 2 (1912), Nos. 7, pp. 113–128; 8, pp. 129–144; 9, pp. 145–148; 10, pp. 149–164*).—The first of these publications contains data regarding the examination of food and drug products, general discussions, and the report of a test by W. L. Stockham on the improvement of flour in storage.

A sample was kept for 3 weeks in a box in which pans of water were standing, the air in the box being heated to between 85 and 95° F. during the day, and part of the time, during the night. A second sample was placed in a

desiccator over sulphuric acid, and a third allowed to remain at ordinary room temperature and humidity. Bread made from the flour showed that in volume, texture, and color there was a difference in favor of bread made from flour which had been kept warm and moist. According to the author, "this moist warm condition could be duplicated in a closed box in any home, as the temperature need not be constant. The change will be brought about in the flour without removing it from the sack and the increase in percentage [of] moisture will scarcely be noticed in handling the flour."

The second of these bulletins includes the results of the examination of food and drug products, with some general discussion and notices issued under the provisions of the state pure food and drug law.

The third contains data regarding secret remedies and similar articles, and the fourth data regarding milk and dairy inspection noted on page 675, restaurant inspection, the examination of food products, and discussions of pure food and drug topics and paint legislation. In connection with the discussion of restaurant inspection, a score card is given.

[Analyses and other pure food and drug work], A. N. Cook (*Ann. Rpt. Food and Drug Comr. S. Dak., 12 (1912), pp. 117*).—The results are reported of the examination of miscellaneous food products, beverages, drugs, and stock foods; topics relating to the general subjects are discussed; and state legislative enactments and pure food and drug bulletins issued during the year are reprinted.

With reference to extracted fruit, it is stated that in the inspection of canned goods a considerable amount of what "might be called extracted fruit" has been found on the market. "The juice seemed to have been withdrawn and the pulp, mixed with sweetened water, canned and sold for normal fruit. The juice was probably used for making jellies or for soda fountain stock."

It is the author's understanding that this practice is very common and that raspberries, blackberries, and other fruits are packed in sugar and after shipment "the juice is drained off and used for the purpose indicated above, while the pulp with what little juice remains is canned as above described." The need for food standards which will render the detection of such practices more easy is pointed out. "Until this is done, it will probably be necessary to depend upon inspection work entirely, which is rather unsatisfactory as such practices are rarely detected in actual operation."

Two papers included in the report are The Assay of Aromatic Sulphuric Acid, by G. G. Frary (pp. 62–65), and the Relative Toxicity of Substances Found in Foods, by A. N. Cook and Sylvanna Elliott (pp. 60–62).

In the study of relative toxicity sodium benzoate, benzoic acid, other acids, sugars of different sorts, alum, and a variety of other substances were compared, goldfish and frogs being used as subjects. In comparing the results, sodium benzoate is taken as 1 and other substances are compared with it. According to the authors, the data obtained with frogs show that "borax, sodium benzoate, and sodium chlorid all have about the same relative toxicity. Sodium salicylate is about twice as toxic as common salt and possesses about the same toxicity as glucose and alcohol. Rochelle salts, occurring in baking powder residues; potassium oxalate, occurring in rhubarb; malic acid, occurring in apples; and cane sugar all are considerably more toxic than sodium salicylate. Cane sugar is about three times as toxic as glucose. Tartaric acid, occurring in grapes, and acetic acid, occurring in vinegar, are more toxic than saccharin. "In case of fishes sodium chlorid is not toxic. The toxicity of cane sugar, glucose, Rochelle salts, alcohol, and potassium oxalate is much less than sodium benzoate; whereas, in case of frogs, their toxicity was much greater. Citric

acid is much more toxic than either caffein or saccharin. Malic, tartaric, and benzoic acids are more toxic than carbolic acid, whereas the reverse is true in case of frogs. In both cases alum seems to be much more toxic than sodium benzoate, caffein, and saccharin."

Attention is called to a matter which is considered of value and very significant. "In each case it will be noted that benzoic acid is much more toxic than sodium benzoate. This is in accord with our general knowledge on the subject with reference to the stronger acids and their salts, for example, hydrochloric and nitric acid are very much more toxic than any of their ordinary metallic salts.

"Such experiments as these are often relied upon at the present time as evidence in court as to the poisonous character of substances used in foods; but after studying the data somewhat carefully . . . [the conclusion is reached] that experiments of this nature upon animals so distantly related to man do not furnish conclusive evidence of the effects of such substances on the human system."

Food inspection decisions (*U. S. Dept. Agr., Food Insp. Decisions 149–150, p. 1 each*).—These decisions have to do, respectively, with the use of copper salts in the greening of foods and frozen citrus fruit.

Kansas Food and Drugs Law, and rules and regulations (*Topeka: Kans. Bd. Health, 1911, 3. ed., pp. 59*).—A collection of Kansas state laws and regulations.

Comparative measurements of the changing cost of living, J. P. NORTON (*Science, n. ser., 37 (1913), No. 944, pp. 159–170, figs. 4*).—Statistical and other data are summarized in this address, presented at the meeting of the American Association for the Advancement of Science, at Cleveland, in January, 1913.

The cost of living, L. MARCH (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, pp. 539–543*).—This is a statistical study made to discover whether the present high cost of living in Paris is due to increased cost of commodities, or to the effort to attain a higher standard of living.

Retail prices, 1890 to June, 1912 (*U. S. Dept. Com. and Labor, Bur. of Labor Bul. 106, pt. 2, 1912, pp. 205*).—This publication, which is a part of the Retail Prices and Cost of Living series (E. S. R., 15, p. 493), contains a large amount of statistical data collected in different parts of the country.

The price of meat in Paris, P. VINCEY (*Le Prix de la Viande à Paris. Paris, 1912, pp. 151, figs. 6; abs. in Jour. Agr. Prat., n. ser., 24 (1912), No. 50, p. 763*).—A discussion of the causes of the high price of meat.

Household accounts in Stockholm, GALLE (*Jahrb. Nat. Ökonom. u. Statis., 3. ser., 41 (1911), pp. 368–376; abs. in Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5–6, pp. 706, 707*).—A study of the household budgets of 270 families in Stockholm.

Poor families were found to spend a much larger portion of their income for food than the rich, and about $\frac{2}{3}$ of the expenditure for meat was for fresh meat, the proportion being greater the less the income of the family. Beef is the meat generally used.

The consumption of all kinds of foods increases with the income of the family except that of lard and fat which diminishes. The quality of food increases with an increase in standards of living. In comparison with German families more meat and milk, but less potatoes, are consumed, and, in general, prices are lower than in Germany.

Labor-saving devices for the farm home, LEAH D. WIDTSOE (*Utah Sta. Circ. 7, pp. 31–76, figs. 13*).—This summary of data, based on a paper read before the First International Congress of Farm Women, on the convenient home discusses such questions as woman versus man on the farm, possible farm and

home labor-saving devices, the model farm home, the comparative cost of farm and home machinery, detail list of home labor-saving devices, and the cooperative ownership of home as well as farm machines. As a whole it presents a strong argument for home conveniences and labor-saving devices.

Report of the biochemical work done under the auspices of the Illinois Pellagra Commission, A. F. Wussow and H. S. Grindley (*Springfield, Ill.: State, 1912, pp. 47*).—Three papers are reported.

Dietary Studies at the Peoria State Hospital (pp. 3–42).—The dietary studies included a general diet, a corn diet, and a corn-free diet.

The general diet, which supplied 73.51 gm. protein and 2,568 calories of energy, and 23.23 gm. mineral matter, of which 1.07 gm. was phosphorus, was chiefly vegetable in nature, "much more so than the average American dietary." The corn diet supplied 87.22 gm. protein and 2,898 calories of energy, and 27.91 gm. mineral matter, of which 1.64 gm. was phosphorus. "The quantities were probably adequate to the needs of the patients receiving them but they can not be considered excessive." The corn-free diet, judged "by the little evidence at hand . . . seems to have been at least equal in nutritive value to the corn diet."

The authors suggest as a tentative standard diet for the state hospitals for the insane 90 gm. protein and 2,700 calories energy per man per day, or 72 gm. protein and 2,200 calories energy per woman per day.

These quantities are intended to represent the requirements of average patients on the basis of food actually eaten.

The ration allowances should allow a margin for waste and shrinkage estimated, when due care is taken, at not more than 12.5 to 15 per cent of the total. "Accepting these values in a very general way, minimum standard rations, corresponding to the standard diets proposed, would be as follows: Per man per day—protein 105 gm., energy 3,150 calories; per woman per day—protein 84 gm., energy 2,550 calories."

"At least 45 to 50 per cent of the protein of the diet should be derived from animal foods. By animal foods, however, is not meant meats exclusively. Eggs and milk and other dairy products should be included."

The diet should at all times possess variety. Especially should it contain an abundance of fresh fruits and vegetables, in season, to insure the proper quantities of the mineral elements. . . .

"The preparation and serving of the food should be given careful attention."

The Corn Meal from the State Institutions (pp. 43–45).—Judged by its moisture content, acidity, the presence of molds and other micro-organisms, and the presence of insects, "the corn meal used in the state institutions, as represented by one 100-lb. sample from each, is, on, an average, of very good grade. It was found to be of better quality than the corn meal obtained from a number of other sources (including 3 samples purchased in the local market, 6 samples from Alabama, and 6 from Italy)."

The Influence of Molds on Corn Meal (pp. 45–47).—An experimental study was made on the effects of molds upon corn meal. "Of the 5 molds examined, only one, *Monascus purpureus*, gave a toxic substance when grown on corn meal in pure form. Another lot of meal upon which a blue-green species of Penicillium had grown, but which had become contaminated by other organisms, was very toxic."

The food of the agricultural people as shown by data collected in 30 families of small farmers in the Rhine provinces, in the year 1910, and the cause of the excessive fat diet in town and country, W. Claassen (*Arch. Rassen u. Gesell. Biol., 9 (1912), No. 3, pp. 347–356*).—Budgets showing kind and quantities of food consumed are presented and discussed. The author be-

lieves that the fat consumed is excessive, owing to the fact that the people have come to believe in the special importance of meat, a view which he does not share.

Studies on the feeding of school children, A. VAN VOORTHUYSEN (*Nederland. Tijdschr. Geneesk., 2 (1912), No. 3, pp. 165–177; abs. in Zentbl. Expt. Med., 2 (1912), No. 15, pp. 695, 696*).—To study the effect of abundant and insufficient food, weighings were made at intervals, of 98 children who were given the school lunch in addition to the food received at home, in comparison with children who did not receive the school lunch.

In the first 2 months, there was an average gain of 172 gm. per child, and in the second period of like duration one of 259 gm., which was a total average gain in the entire period of 87 gm. more than was made during the same time by children who did not receive the school lunch. In a similar test made with 44 children receiving the school lunch in addition to their regular food, the gain was 405 gm per child, the larger gain, in the author's opinion, being attributable to a greater amount of fat in the diet. The school lunch supplied in the first test contained 19 gm. protein, 8 gm. fat, and 100 gm. carbohydrates.

The investigation showed, according to the author, that the children of the poorer people dependent solely upon the food received at home gained in weight very slowly, while the children receiving the school lunch in addition gained more rapidly. He is of the opinion that, in general, the ordinary food is deficient in fat and protein. He considers that 60 gm. protein per day is not too much for a child, and that dietary conditions can be improved by adding protein to the ration.

The growth of children, F. BOAS (*Science, n. ser., 36 (1912), No. 937, pp. 815–818*).—Statistical and other data are presented in this discussion of growth.

According to the author, "a study of the phenomena of growth of various groups of the same population has shown that early development is a concomitant of economic well-being, and that a characteristic of the poor is the general retardation in early childhood, and the later rapid growth. It follows from this that there is a corresponding, although not equal, retardation in early mental development, and a crowding of developmental processes later on, that probably place a considerable burden on the body and mind of the poor, which the well fed and cared for do not bear. The general laws of growth show also that a retardation kept up for an unduly long period can not be made up in the short period of rapid growth; so that it would seem that, on the whole, excessive retardation is an unfavorable element in the growth and development of the individual. Whether there are similar disadvantages in a considerable amount of early acceleration is not so clear."

Protein metabolism from the standpoint of blood and tissue analysis.—III, Further absorption experiments with special reference to the behavior of creatin and creatinin and to the formation of urea, O. FOLIN and W. DENIS (*Jour. Biol. Chem., 12 (1912), No. 1, pp. 141–162*).—The authors refer to their previous work on the absorption of the amino acids (E. S. R., 26, p. 869), and report further experiments.

The absorption of creatinin and creatin was studied by injecting solutions of these substances into the intestines of cats which were etherized. Ligatures were applied to prevent the escape of the materials under absorption and samples of the blood and muscles were tested before injection and at the end of 2 or 3 hours. During this period, it was found that both the creatinin and creatin were absorbed into the blood and muscles. No evidence was found of the transformation of creatinin into creatin, nor of the conversion of creatin into urea.

The formation of urea was studied by injecting cats in the same manner with solutions of alanin, glycocoll, and peptone. The tests of the blood and muscles showed an increase of urea nitrogen after about an hour. From these data the authors draw the conclusion "that the absorption of amino acids is, after a while, accompanied by the formation of urea." The experiments "do not furnish any definite evidence as to where the urea is formed," but, "so far as we yet know, the urea-forming process is one characteristic of all the tissues and by far the greatest amount of the urea is therefore probably formed in the muscles."

Protein metabolism from the standpoint of blood and tissue analysis.—IV, Absorption from the large intestine, O. FOLIN and W. DENIS (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 253–257*).—It is generally conceded that soluble products are absorbed from the large intestine, as is indicated by the commonly accepted practice of rectal feeding. Nevertheless, the authors thought it desirable to determine experimentally whether such absorption is extensive enough to be demonstrable by means of their new methods of blood analysis.

The experimental data recorded "show that while the absorption from the large intestine, as was to be expected, is not nearly so rapid as from the small intestine, it is rapid enough under the conditions selected to cause an appreciable accumulation of the absorbed products in the blood."

Protein metabolism from the standpoint of blood and tissue analysis.—V, Absorption from the stomach, O. FOLIN and H. LYMAN (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 259–264*).—The experimental data recorded, according to the authors, "clearly prove that nitrogenous digestion products are absorbed from the stomach."

Protein metabolism from the standpoint of blood and tissue analysis.—VI, On uric acid, urea, and total nonprotein nitrogen in human blood, O. FOLIN and W. AENIS (*Jour. Biol. Chem., 14 (1913), No. 1 pp. 29–42*).—The amounts of urea nitrogen and nonprotein nitrogen in the blood of normal persons vary little in different individuals, from which it appears that the normal kidney maintains a remarkably constant level of these substances in the blood.

In the case of individuals whose kidneys are weakened by diseases, especially nephritis and gout, the amounts of nonprotein nitrogen and urea in the blood varied a great deal and showed an increase over the normal in the majority of the cases studied. No relationship apparently exists between the amount of uric acid and the amount of urea or total nonprotein nitrogen in human blood; the amount of the latter substances present is inversely proportional to the general efficiency of the kidney, but this is not so true in the case of the uric acid. An increase of uric acid was found in the blood of persons suffering from gout. The authors regard the work as a preliminary survey and expect to follow it up with further experiments.

Behavior of inorganic food constituents in the intestinal tract.—I, Behavior of calcium and iron of meat during digestion, E. ABDERHALDEN and R. HANSLIAN *Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 2–3, pp. 121–135; abs. in Chem. Zentbl., 1912, II, No. 22, p. 1834*).—To determine whether or not inorganic constituents of undigested material retain their original characteristic form, horse flesh from which neither iron nor calcium could be extracted by boiling for an hour was digested at 37° with pancreatin. At intervals digestion was halted and the liquid examined.

After a short time, for instance 8 days, the greater part of the iron and calcium was found in the liquid. Since digestion causes a characteristic cleavage of organic and inorganic materials alike and works against a specific

structure, the inorganic constituents of normal foods are evidently not resistant to cleavage. It is enough if the necessary elements are present in sufficient amount and in a form which undergoes cleavage readily.

The regulation of body temperature in extremes of dry heat, E. H. HUNT (*Jour. Hyg. [Cambridge], 12 (1912), No. 4 pp. 479–488*).—According to the author's summary, "comfort and health can readily be maintained in dry heat where for long periods the air temperature is above that of the body.

"The amount of water absolutely required, and actually consumed, is very large; and this is accounted for by the necessity for neutralizing, in some circumstances, the whole heat of metabolism (requiring up to 6,000 cc.) and in addition a variable but sometimes very large amount of heat added to the body by radiation and conduction.

"A healthy man carries in his body a large reserve of water, this reserve being mainly stored in muscle and being so readily available that the percentage of water in the blood is not appreciably diminished even when several liters of water have been lost by sweating. If, however, it be extensively drawn on, replacement seems to occupy many hours, and this delay is an important factor, forming a strong argument against any undue or needless use of stored water owing to restriction of drinking."

The excretion of water in the breath, A. LOEWY and H. GERHARTZ (*Biochem. Ztschr., 47 (1912), No. 3–4, pp. 343, 344*).—A preliminary communication and controversial article. According to the authors, air respired through the mouth is a little warmer than that respired through the nose.

ANIMAL PRODUCTION.

Some biological principles of animal breeding, W. E. CASTLE (*Amer. Breeders Mag., 3 (1912), No. 4, pp. 270–282, fig. 2*).—This is mainly a discussion of the value of Mendel's law for judging pedigree. The results of the author's work in modifying the coat pattern of hooded rats by selection is given in detail as evidence against the genotype conception of heredity, in which unit characters are regarded as unmodifiable.

"Unit characters may arise gradually as the result of repeated selection in a particular direction. . . . If unit characters are immutable, then straight selection is a waste of time, and the only procedure for the breeder well worth while is to hybridize and thus seek new combinations of unit characters. . . .

"Mendel's law, in its broad general features, does stand the test of practice. . . . It throws light on those recognized exceptions to the generalization that like begets like, and shows under what circumstances those exceptions are to be expected. It shows why and when pedigree counts, and under what circumstances a knowledge of pedigree is of no consequence whatever. It shows why inbreeding brings uniformity of type, and crossbreeding destroys it. Mendel's law is then a first step toward the establishment of a science of animal breeding. But it is only a first step on a long and weary road, and we must be careful not to misinterpret or misapply it. . . . Further we are not yet warranted in concluding that all inheritance is unit-character inheritance. . . .

"The practical utility of Mendel's law is much greater to the plant breeder than to the animal breeder, because the plant breeder is concerned largely with the production of a very few first generation or second generation hybrids of merit, which are then multiplied indefinitely by asexual means of self-fertilization. In the case of the domesticated animals such methods of multiplication are impossible. . . . As a theoretical foundation principle Mendel's law is equally valuable to animal breeders and to plant breeders."

The present condition of animal breeding, H. KRAEMER (*Ztschr. Pflanzenzücht., 1 (1912), No. 1, pp. 69–83*).—A review and discussion of recent work on the principles of breeding animals.

Studies on the historical development and correlation of animal breeding and veterinary science, E. A. HAAS (*Studien über die historische Entwicklung von Tierzucht und Tierheilkunde und ihre Correlation. Inaug. Diss., Univ. Bern, 1912, pp. 68*).—A brief outline of the history of domestication and of veterinary science. A bibliography is appended.

History of our domesticated animals, M. HILZHEIMER (*Geschichte unserer Haustiere. Leipsic [1912], pp. 100, figs. 38*).—This treats of the changes in the animal form caused by domestication, origin of the different types of modern breeds, and related topics which are presented in a popular manner.

Skeleton of a dog and other remains of domesticated animals of the third or fourth century from the Paulinian Meadows (Mark), M. HILZHEIMER (*Ztschr. Morph. u. Anthropol., 15 (1912), No. 2, pp. 229–246, pl. 1, fig. 1*).—This reports measurements and a description of the skeleton of a dog and parts of the skeletons of swine, cattle, and 1 goat, which are probably the remains of domesticated animals of the Bronze Period.

Concerning the development of the conception of species, A. VON TSCHERMAK (*Tierärztl. Zentbl., 34 (1911), No. 23, pp. 351–358; abs. in Arch. Rassen u. Gesell. Biol., 9 (1912), No. 4, pp. 497, 498*).—A discussion of variation, selection, heredity, mutation, and the genotype theory.

The significance of osmotic membranes in heredity, A. B. MACALLUM (In *The Harvey Lectures 1908–9. Philadelphia and London, 1910, pp. 180–212*).—A critical review and investigations on the causes of osmosis, which is a fundamental factor in metabolism and all like processes.

From his own studies the author concludes that inorganic salts are not found in the nucleus, being kept out by the nuclear membrane. It is also probable that fats, free carbohydrates, and free proteins are excluded, though the nuclear membrance is permeable to iron-holding nucleoproteins that are synthesized in the cytoplasm. Consequently, the chief function of the nucleus is to protect these nuceleoproteins from chemical alterations which are handed down from parent germ plasm to the next generation.

"A germ plasma in the sense implied by Weismann may exist, but on the view here advanced its continuity is one of type rather than of identical molecules, for the nuclear membranes of the germ cells sort out or select from all the iron-holding nucleoproteids from the various portions of the body that reach such germ cells those of a certain definite fixed composition and any other nucleoproteids that may be present are excluded from the nuclei of the ova and spermatid cells. Such selected or sorted out iron-holding nucleoproteids may in a manner represent the gemmules of Darwin's theory. Such compounds transmit the inherited parental characters and, to continue the transmission in the offspring of such characters, provide for the maintenance of some type of nuclear membrane in the germ cells of the offspring."

The fertility of hybrids in a mammalian species cross, J. DETLEFSEN (*Amer. Breeders Mag., 3 (1912), No. 4, pp. 261–265*).—Over 1,700 hybrids of various blood relations were obtained by crosses of the wild Brazilian cavy (*Cavia rufescens*) and the domesticated guinea pig (*C. porcellus*).

All female hybrids were fertile. The fertility of about 400 male hybrids was tested by making a small incision in the scrotum and puncturing the epididymis at one or several points, and placing the liquid contents in a normal salt solution at bodily temperature and examining with a microscope. There was a great individual difference in the hybrids. Some males possessed no sperm but

contained some incompletely matured spermatogonia. Others possessed a few nonmotile or motile spermatozoa in addition. Still others had an abundance of motile, normal spermatozoa.

The results are summarized in the following table:

Fertility of hybrid guinea pig males.

Class of hybrids.	Total number tested.	Percentage with any sperm.	Percentage with any motile sperm.	Percentage readily fertile.
One-half wild	6	.....	.....	.....
One-fourth wild	22	25.0	.....	.....
One-eighth wild	71	47.8	17.3	9.8
One-sixteenth wild	94	71.1	46.6	35.5
One thirty-second wild	89	88.7	62.9	60.7
One sixty-fourth wild	21	100.0	66.7	66.7

When fertile male hybrids were mated to female hybrids the male offspring were not necessarily fertile. On the other hand, when fertile male hybrids were mated to a guinea pig female the male offspring were always fertile, as is to be expected since the fertile male hybrid may be regarded as a recessive in which the disturbing elements have been eliminated.

It is suggested that by following a similar method with hybrids of other mammals, notably the horse and ass, the desired characters in hybrids may be combined with fertility of both sexes.

Interstitial testicular cells and secondary sex characters, J. DES CILLEULS (*Compt. Rend. Soc. Biol.* [*Paris*], *73* (*1912*), *No. 28, pp. 371, 372; abs. in Jour. Roy. Micros. Soc.* [*London*], *1912, No. 6, pp. 605, 606*).—The author reports investigations from which he concludes that "the appearance of the secondary sex characters in the young cock coincides with the appearance of interstitial cells in the testes, that the interstitial cells and the cock characters increase pari passu, and that the cock characters are accentuated while the seminal tubes still remain in an embryonic condition, till after the sixtieth day. The explanation offered is that the internal secretion of the interstitial cells serves as a stimulus for the development of the secondary sex characters."

Comparative anatomy of vertebrates, J. S. KINGSLEY (*Philadelphia, 1912, pp. IX+401, figs. 346; rev. in Science, n. ser., 37* (*1913*), *No. 943, pp. 148–150*).—This book is not a description of any species in detail, but an outline of the general morphology of all vertebrates, with embryology as a basis, so that the various structures can be traced from the undifferentiated egg.

A bibliography is appended.

Anatomical and histological investigations on the structure and origin of the horn in the guinea hen, R. SCHMIDT (*Anatomische und histologische Untersuchungen über den Bau und die Ursachen des Hornes beim Perlhuhn* (*Numida meleagris*). *Inaug. Diss., Univ. Bern, 1910, pp. 36, pl. 1*).—This study of the horny tissue on the head of guinea hens led to the conclusion that it is an epidermal structure, similar to that of the horns of the hollow-horned ruminants.

The bilaterality of the pigeon's egg, G. W. BARTELMEZ (*Jour. Morph., 23* (*1912*), *No. 2, pp. 269–328, pls. 8, figs. 4*).—This is a study in egg organization from the first growth period of the oocyte to the beginning of cleavage.

Mechanism of nuclear division and of fertilization, R. GEIGEL (*Arch. Mikros. Anat., 80* (*1912*), *No. 4, II, pp. 171–188, figs. 7; abs. in Jour. Roy. Micros. Soc.* [*London*], *1912, No. 6, p. 605*).—To account for the movement of

the spermatozoon toward the ovum and the attraction of the centrosomes on the chromosomes, the author postulates a new kind of vital action from a distance, which is not identifiable with gravitational, electrical, or magnetic attraction but may be ranked with them.

Ehrlich's theory and our knowledge on nutrition, L. PROHASKA (*Deut. Landw. Presse, 38 (1911), No. 44, p. 518*).—An attempt to harmonize Ehrlich's side chain theory of immunity with the modern theory of the chemistry of protein in the animal body.

Investigations on the value of ordinary and prepared sawdust in animal nutrition, F. HONCAMP ET AL. (*Landw. Vers. Stat., 78 (1912), No. 1–2, pp. 87–114; abs. in Analyst, 37 (1912), No. 441, pp. 559, 560*).—Common sawdust from coniferous trees and sawdust hydrolyzed with sulphuric acid under pressure by the method previously described (E. S. R., 28, p. 571) were fed to wethers.

The digestion coefficients indicated that the raw sawdust was without appreciable nutritive value, and in some ways affected unfavorably the assimilation of other components of the ration. The nonnitrogenous extract and the fat were slightly better utilized in the treated sawdust than in the raw sawdust, but there was an unfavorable effect on the digestibility of the protein and fiber. There is a review of other investigations on this subject.

Judging green fodder maize (*Agr. Gaz. N. S. Wales, 23 (1912), No. 11, p. 950*).—A score card for judging a growing crop of corn, from the point of view of its value as a fodder, is presented.

Commercial feeding stuffs, J. P. STREET (*Connecticut State Sta. Rpt. 1912, pt. 4, pp. 297–340*).—This is a report of the state feed inspection, including analyses of cotton-seed meal, linseed meal, wheat bran, wheat middlings, red dog flour, gluten feed, hominy feed, rye products, buckwheat middlings, malt sprouts, dried brewers' grains, dried distillers' grains, dried beet pulp, proprietary mixed feeds, beef scrap, and fish meal.

Results of examination of stock feeds, B. L. PURCELL (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul. 20, 1911, pp. 126–146*).—Analyses are reported of wheat bran, ship stuff, corn-oil meal, corn meal, cracked corn, gluten meal, cotton-seed meal, linseed meal, rye middlings, wheat middlings, red dog flour, wheat offal, alfalfa, and proprietary feeds.

[Live stock in Holland], E. RABATÉ and J. E. LUCAS (*Bul. Mens. Off. Renseig. Agr. [Paris], 11 (1912), Nos. 8, pp. 1039–1069; 9, pp. 1189–1220*).—This contains statistics on the live-stock industry in Holland, with descriptions of the breeds and data on herd books of breeders' associations, cooperative dairies, meat production, slaughter establishments, and cooperative egg selling.

[Report of the] department of animal husbandry, W. A. LINKLATER (*Oklahoma Sta. Rpt. 1912, pp. 17–21*).—Twenty steers on a ration of cotton-seed meal and hulls fed in an open lot for 87 days made an average daily gain of 1.87 lbs., at a cost of 8.2 cts. per pound. A similar lot on Kafir corn hay, silage, and cotton-seed cake made an average daily gain of 2.18 lbs., at a cost of 5.6 cts. per pound. A third lot on Kafir corn hay, silage, and cold pressed cake made an average daily gain of 1.8 lbs., at a cost of 6.4 cts. per pound.

In a poultry fattening test the fattest and cheapest gains were made on a ration of corn chop, "mill run," cotton-seed meal, and buttermilk. In a sheep feeding test alfalfa, Kafir corn chop, and wheat bran produced faster and cheaper gains than when Kafir corn silage replaced a portion of the alfalfa. There is a preliminary report on a comparison of pure-bred and crossbred lambs, and an abstract of a hog feeding test, previously noted (E. S. R., 27, p. 278).

Winter steer feeding, 1911–12, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 163, pp. 713–749*).—A continuation of earlier work (E. S. R., 26, p. 568).

In these tests steers weighing nearly 1,000 lbs. each were fed 160 days. There were 10 animals in each lot, and their initial value was $5.55 per 100 lbs. live weight. The concentrates used were shelled corn and cotton-seed meal. Some of the results of feeding different roughages are summarized in the following table:

Results of feeding different roughages to steers.

Lot.	Roughage.	Average daily gain.	Cost of gain per pound.	Actual selling price per 100 pounds.	Profit per steer, not including pork.
		Pounds.	*Cents.*		
1	Clover hay, corn silage once a day	2.34	12.40	$8.25	$10.51
2	Clover hay	2.38	14.23	8.25	3.37
3	Corn silage	2.52	9.88	8.35	20.96
4	Clover hay, corn silage twice a day	2.32	11.06	8.10	13.58
5	Oat straw, corn silage once a day	2.16	11.27	8.10	13.73
6	Oat straw, corn silage twice a day	2.40	10.16	8.25	18.83
7	Fed as lot 6, except that no corn was fed the first 60 days	2.20	9.50	8.10	19.66

To compare the relative advantages of long and short feeding, the results for lots 6 and 7 are also given at the end of 100 days. During this period lot 6 made an average daily gain of 2.3 lbs., at a cost of 11.29 cts. per pound, and lot 7 made a gain of 2,395 lbs. per head and day, at a cost of 11.02 cts. per pound. It is stated that the profit from feeding was unusually large because of favorable market conditions.

Winter steer feeding, 1911–12, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 163, popular ed., pp. 3–12*).—A popular summary of the above.

Afrikander cattle, A. HOLM (*Agr. Jour. Union So. Africa, 4 (1912), No. 5, pp. 687–692, figs. 2*).—This contains notes on the origin and characteristics of the Afrikander breed and the scale of points used in judging.

The results of hybridizing experiments with the gayal (Bibos frontalis) in the zoological garden of the Agricultural Society at the University of Halle, S. VON NATHUSIUS (*Kühn Arch., 1 (1911), pt. 1, pp. 61–105*).—Shorthorn, Jeverländ, Simmental, Oldenburg, Dutch, and Prätigau cattle were crossed with the Asiatic gayal, which was found to reproduce periodically. Detailed descriptions of the hybrids are given.

Breeding experiments with humped cattle (Bos indicus) from India and Africa, S. VON NATHUSIUS (*Kühn Arch., 1 (1911), pt. 1, pp. 225–252, figs. 4*).—This contains descriptions of the hybrids resulting from crosses of European breeds with both African and Indian zebus. The hybrids as a rule were large, with long legs, narrow chest, and a tendency to fatten, and are thought to be less valuable for breeding in Europe than for the European colonies.

Buffalo breeding in Western Transcaucasus, E. TURKIN and I. SICORZOFF (*Moloch. Khoz. i Skotov., 11 (1912), No. 23, pp. 461–465; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, p. 2038*).—A general and statistical account of the breeding of domesticated buffalo. The average yield of milk during the best season was from 1.75 to 2.5 gal. daily, and 175 lbs. of butter can be made annually from the milk of one good buffalo. Their qualifications as draft animals are also discussed.

Fattening western lambs, 1910–11 and 1911–12, J. H. SKINNER and F. G. KING (*Indiana Sta. Bul. 162, pp. 673–710, fig. 1*).—In 2 series of trials with timothy as a roughage for fattening lambs, the selling value and amount of gain were less, and the cost of gain more, than with clover hay as a roughage. In one series, shelled corn was the only grain fed, while in the other both shelled corn and cotton-seed meal were given. In three other tests the addition of silage once a day to replace a portion of the clover hay cheapened the ration but did not increase the rate of gain.

No bad effects were produced by feeding lambs large quantities of silage. Lambs fed silage twice daily made approximately the same gains as others fed silage once daily, but made cheaper gains and acquired a better finish.

In a test of supplements the addition of cotton-seed meal to a ration of shelled corn and timothy increased the rate of gain, decreased the cost of gain, added to the selling value of the lambs, and increased the appetites of the lambs for both hay and grain.

The addition of cotton-seed meal to a ration of shelled corn and clover hay slightly increased the rate of gain and added to the selling value of the lambs; it did not affect the cost of gain when corn was as low as 40 cts. per bushel, but made a slight decrease when corn was above 40 cts.

The addition of cotton-seed meal to a ration of shelled corn, clover hay, and corn silage had no effect on the roughage consumption, but slightly increased the grain consumption in 1 of 3 trials. It increased the rate of gain and added to the selling value of the lambs. It did not affect the cost of gain when corn was valued at 50 cts. per bushel, but made a slight decrease when corn was above 50 cts.

Rations for fattening range lambs, B. E. CARMICHAEL and J. W. HAMMOND (*Ohio Sta. Bul. 245, pp. 685–722, figs. 4*).—This bulletin presents the results of 4 years' work in testing rations for fattening range lambs, being a continuation of earlier work (E. S. R., 19, p. 973).

In the first test 4 lots of lambs, with 40 in each lot, were fed for 77 days. The gains and cost were as follows: On corn and timothy hay the average daily gain was 0.295 lb., at a cost of 7.4 cts. per pound; corn, oil meal, and timothy hay 0.344 lb., at a cost of 7.11 cts. per pound; corn, oil meal, timothy, and alfalfa hay 0.379 lb., at a cost of 6.42 cts. per pound; and corn, oil meal, timothy, and alfalfa hay, with only three-fourths as much concentrates as the last lot, 0.31 lb. at a cost of 6.97 cts. per pound.

In a test of roughages fed with corn, 4 similar lots of 25 lambs each were fed for a period of 70 days, with the following gains per head a day: On corn, oil meal, and corn stover 0.259 lb., at a cost of 7.76 cts. per pound; corn, oil meal, and soy-bean straw 0.277 lb., at a cost of 7.45 cts.; corn and clover hay 0.359 lb., at a cost of 6.72 cts. per pound; corn and alfalfa hay 0.329 lb., at a cost of 7.83 cts. per pound. In a further test of roughages lasting 93 days, the rations and gains with 8 lots of from 11 to 13 lambs each were as follows: On corn and clover hay the gain was 0.318 lb., at a cost of 6.94 cts. per pound; corn and alfalfa hay 0.343 lb., at a cost of 6.99 cts.; corn and oat straw 0.182 lb., at a cost of 10.25 cts.; corn and corn stover 0.225 lb., at a cost of 8.26 cts.; corn, oil meal, and clover hay 0.293 lb., at a cost of 8.17 cts.; corn, oil meal, and alfalfa hay 0.338 lb., at a cost of 7.64 cts.; corn, oil meal, and oat straw 0.236 lb., at a cost of 8.63 cts.; corn, oil meal, and corn stover 0.259 lb., at a cost of 7.86 cts. per pound. This last test was repeated with 15 lambs in each lot for a period of 83 days, with the gains and cost as follows: Corn and clover hay 0.332 lb., at a cost of 6.71 cts.; corn and alfalfa hay 0.372 lb., at a cost of 6.48 cts.; corn and oat straw 0.22 lb., at a cost of 7.65 cts.; corn and corn stover 0.258

lb., at a cost of 7.48 cts.; corn, oil meal, and clover hay 0.339 lb., at a cost of 7.08 cts.; corn, oil meal, and alfalfa hay 0.387 lb., at a cost of 6.84 cts.; corn, oil meal, and oat straw 0.247 lb., at a cost of 7.82 cts.; corn, oil meal, and corn stover 0.308 lb., at a cost of 7.03 cts.

The amount and composition of the manure produced in the last 2 tests were determined. The lots fed clover and alfalfa hay contained a higher percentage of nitrogen and had a higher value both per ton and head than did that from the lots fed oat straw and corn stover. The manure from the lots fed oil meal contained a higher percentage of nitrogen and had a higher value per ton and head than that from the other lots.

Data are also given on the composition of feeds, composition of refuse in the manger from each kind of roughage, shrinkage in shipping, expense of shipping and marketing, and slaughter tests.

The effect of large amounts of magnesium chlorid in the drinking water of sheep, A. STUTZER and S. GOY (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 233–246*).—Water having a chlorin content of 3 gm. per liter was drunk by sheep without any apparent injury.

Improved types of sheep for the Southwest, F. W. WILSON (*Arizona Sta. Bul. 69, pp. 615–654, pls. 7, figs. 3*).—The character of the types of sheep needed for the valleys and ranges of southwestern United States are discussed, as are also the native Arizona types. There is a further report on experiments in crossing native with Tunis sheep (E. S. R., 23, p. 673; 24, p. 772).

The average gestation period for native ewes mated with a pure-bred Tunis ram was found to be 150.8 days, and with a pure-bred Shropshire 149.6 days. The first generation of Tunis-Native ewes with the same pure-bred Shropshire gave a period of 148.9 days. The average weight of the fleece from the different types was as follows: Native lambs of the Salt River Valley type 9.58 lbs., Tunis-native of the same type 10.5 lbs., Tunis-native (Farr and Edie type), 4.77 lbs., and Shropshire-native (Campbell and Francis type), 3.07 lbs. The quality of the Shropshire-native wool was much better than that of the Tunis-native, but the wool of the Campbell-Francis dams was superior to that of the Farr-Edie.

Figures illustrating the value of the Tunis-native for mutton production are given as follows: Average of 7 Tunis-natives, weight at birth 8.21 lbs., weight at 6 months 67.85 lbs., weight at 1 year 105.57 lbs.; of 7 native lambs, birth weight 6.93 lbs., weight at 6 months 64.78 lbs., weight at 1 year 90.35 lbs. The Tunis-native lambs matured earlier than either the native or the Shropshire-native. They dressed to advantage and yielded mutton of excellent quality.

A description of the native sheep of Tunis and Algeria, by A. E. Vinson (pp. 637–639), is included.

Studies on the race characteristics of horses, G. MALICKE (*Studien über Rassenmerkmale bei Pferden. Inaug. Diss., Univ. Bern, 1910, pp. 78*).—Measurements are given of English, Hungarian, Prussian, Russian, German, Danish, Belgian, and French horses, with a discussion of the vertical index, cranial capacity, metatarsus, and chestnuts and other characters of different types.

Investigations on the ancestry of fast and slow horses and the strength of bones, H. HENSELER (*Arb. Deut. Gesell. Züchtungsk., 1912, No. 14, pp. 149, tables 19, pls. 10, figs. 76*).—This discusses the evolution and ancestry of modern types of horses, and reports studies on the chemical composition, elasticity, flexibility, and torsion of bones, and measurements of 16 living horses. There were found to be no chemical differences in the bones of the 2 types, but from the small number measured it was found that the individual differences in the physico-mechanical properties were less than the difference between the 2 types.

Concerning the horse of the migration period, M. HILZHEIMER (*Zool. Anz., 40 (1912), No. 4–5, pp. 105–117, figs. 2*).—This contains a description and measurements of a skeleton of a horse found near Berlin, and a discussion as to its relation to other types.

Actual evolution phenomena in South American horses, L. VAN DE PAS (*Aktuelle Evolutions-Erscheinungen bei dem Südamerikanischen Pferde. Inaug. Diss., Univ. Bern, 1912, pp. 38, figs. 17*).—Measurements are reported of the bones of the Criollo breed of Argentina, with a discussion of the changes in the metacarpals, metatarsals, and teeth in the evolution of the horse.

Poultry craft, J. H. ROBINSON (*Boston, 1911, pp. VI+272, pl. 1, figs. 93*).—A general treatise on poultry for the practical man.

Studies on the pathological characteristics of the bare-necked and crested fowls, F. SASSENHAGEN (*Studien über pathologisch begründete Unterscheidungsmerkmale von Hühnerrassen, speziell der Nackthälse und der Haubenhühner. Inaug. Diss., Univ. Bern, 1912, pp. 51, pls. 2*).—The author reports histological studies of these 2 types of fowl, which are considered to be in the nature of pathological mutations.

Contributions to the knowledge of the distinguishing characters in breeds of pigeons, H. OTTO (*Beiträge zur Kenntnis der pathologisch begründeten Unterscheidungsmerkmale bei Taubenrassen. Inaug. Diss., Univ. Bern, 1910, pp. 52, pl. 1*).—Measurements of the bill and other parts of the skulls of pigeons are given, and a discussion is given of the variations which are considered pathological modifications.

Activity in Canadian fox farming, W. FROST ET AL. (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 9, pp. 177–189*).—This contains information on a new branch of animal industry.

DAIRY FARMING—DAIRYING.

What does one hundred pounds of milk cost the dairyman? E. H. THOMSON (*Tribune Farmer [N. Y.], 11 (1912), No. 555, p. 1*).—In determining the cost of 100 lbs. of milk the author relies largely upon the records from 16 herds of a cow testing association in New York.

Approximately 3,200 lbs. of roughage and 1,682 lbs. of grain per head were fed during the year, with pasture for about 5 months, and costing (with hay at $15, grain at $30, and pasture at $1 a month) $54.23. The labor cost per cow is estimated at $24 a year, barn rental at $5, and depreciation and interest on investment at $7.50, making a total cost of $90.73. At the New York exchange prices for the last 6 years of $1.60 per 100 pounds for the 26 cts. freight zone, it would therefore be necessary for a cow to produce at least 5,675 lbs. in order to meet expenses. The records of the 16 herds show an average yearly production of only 5,621 lbs.

Keeping records of dairy cows, C. H. ECKLES (*Missouri Sta. Circ. 57, pp. 177–184, figs. 6*).—The value of keeping records of dairy cows is pointed out, and also a practical plan for keeping such records.

Cow-testing associations, A. S. COOK (*New Jersey Stas. Circ. 16, pp. 3–16*).—This circular explains the purpose of cow-testing associations, the methods of organizing, and the manner in which the records are kept.

Cakes as feed for dairy cows, L. MALPEAUX (*Vic Agr. et Rurale, 1913, No. 5, pp. 123–126*).—This discusses the nutritive value of linseed, cotton-seed, sesame, peanut, poppy, copra, and soy-bean cakes.

The influence of industrial by-products on the quality of milk in connection with its use as food and in the dairy, G. FASCETTI (*Bul. Assoc. Agr. Friulana, 7. ser., 29 (1912), No. 9–18, pp. 253–260; abs. in Internat. Inst. Agr.*

[*Rome*], *Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2674–2679*).—A general review of our knowledge regarding the effect on milk of the use of beet pulp, oil cakes, and other by-products as feeds for dairy cows.

Milk and its products, H. H. WING (*New York, 1913, 2. ed., rev. and enl., pp. XVI+433, figs. 63*).—In this edition (E. S. R., 9, p. 689) new material has been added on dairy cattle, the production of milk, certified milk, and the manufacture of ice cream. The other chapters have been brought up to date.

Milk in relation to disease, J. B. BUXTON (*Jour. Roy. Sanit. Inst., 34 (1913), No. 2, pp. 137–146*).—The author discusses some of the results of scientific investigations which have thrown light on the spread of tuberculosis, scarlet fever, typhoid fever, septic sore throat, and other diseases by means of milk.

A statistical study of the streptococci from milk and from the human throat, E. C. STOWELL, C. M. HILLIARD, and M. J. SCHLESINGER (*Jour. Infect. Diseases, 12 (1912), No. 2, pp. 144–164, figs. 4*).—In a comparative study of 240 pure strains of streptococci from the normal throat and from milk no features other than fermentative reactions were found to be sufficiently correlated to assist in grouping the organisms or in distinguishing the source of isolation.

"Milk streptococci are distinguishable from the throat organisms of the same morphology (1) by their higher acid production in substances in which they grow, (2) by their greater independence of temperature relations, (3) by their general incapacity to ferment more complex test substances than the disaccharids. On the other hand, the throat strains in at least half the cases (1) ferment a more complex test substance and (2) in almost all cases fail to ferment a higher test substance than the monosaccharid at the room temperature.

"We do not attempt to fix names or to establish any ultimate taxonomic relations by this study. We feel that the study, together with contemporary work in bacteriological biometrics, indicates the most fruitful, though laborious way in which we are obliged to split up systematically our present unwieldy and meaningless genera."

The Baltimore epidemic of streptococcus or septic sore throat and its relation to a milk supply, L. P. HAMBURGER (*Bul. John Hopkins Hosp., 24 (1913), No. 263, pp. 1–11, pl. 1, figs. 8*).—This is a final report of work previously noted (E. S. R., 27, p. 177). Some of the conclusions drawn are the following: "The undue prevalence of sore throat and other influenzoid affections should be reported to the municipal health department for investigation as to the possibility of milk conduction of the infection. A streptococcus infection when it is introduced into a community through milk possesses an extreme virulence and may produce a clinical picture characteristic in some aspects and complicated in many. It is possible that raw milk from any dairy, though carefully produced and handled, may at some time convey a streptococcus infection. . . .

"From a study of the American epidemics of streptococcus or septic sore throat the importance of thorough pasteurization of clean milk in its final containers under efficient official inspection is clear. . . . If by accident the pasteurizing plant of a dairy is disabled the dairy should notify its patrons to boil the milk. When the price of pasteurized milk is prohibitive it is suggested that the practice of boiling milk should be advocated or instruction in home pasteurizing should be given in medical dispensaries by visiting nurses and by physicians. Finally, it is obvious that milk inspection as at present conducted is inadequate."

A consideration of the milk supply of Baltimore, W. W. FORD (*Bul. Johns Hopkins Hosp., 24 (1913), No. 263, pp. 25–28*).—Bacterial counts and other data on the production of sanitary milk are reported.

Milk inspection, E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 10, pp. 150–155*).—A brief report of the results of milk inspection in North Dakota.

The eradication of the tuberculous milch cow, P. J. SIMPSON (*Jour. Roy. Sanit. Inst., 34 (1913) No. 2, pp. 126–131*).—Practical methods for maintaining profitable dairy herds free from tuberculosis are suggested.

The destruction of bacteria in milk by ultra violet rays, S. H. AYERS and W. T. JOHNSON, Jr. (*Jour. Wash. Acad. Sci., 3 (1913), No. 6, pp. 160–164*).—Milk exposed to ultraviolet rays, generated by a quartz mercury vapor lamp operating on a 220 volt direct current circuit taking 3.5 amperes, showed a marked reduction in bacterial content. The rays did not exert any specific bactericidal power on any particular group of bacteria, but there was a difference in the action of the rays on the bacteria in the vegetative and in the spore stage. Under similar conditions of exposure there was less bacterial reduction in 15 per cent cream than in milk, probably due to the fact that the cream when picked up by the revolving drums was in a thicker layer than was the milk.

The work indicates that with quartz mercury vapor lamps of the present power and construction it will not be possible to sterilize milk completely by ultraviolet rays. The disagreeable flavor imparted to the milk by exposure to the rays also renders the process impracticable on a commercial scale at the present time.

The bacteria of bad business, J. R. WILLIAMS (*World's Work, 25 (1913), No. 4, pp. 443–458, figs. 19*).—A report of a study of the milk supply of the city of Rochester, N. Y., with special reference to the cost of distribution.

In a section in which most of the inhabitants are negroes, 23 distributors of milk were traveling 20 miles daily to supply 165 homes, which could be supplied by 1 distributor traveling only 2 miles. On an average in each of 4 sections of American workmen, 47 distributors were traveling 38 miles to 431 homes. In each of 4 districts of foreign workingmen, 49 distributors were traveling 37 miles to serve 317 homes, which 1 dealer could supply in 2½ miles of travel.

Other data are also given showing the great economic loss under the present system of distribution. The author believes that the fundamental reason that impure milk is sold is economic and not sanitary, and that the milk problem can be solved by a better economic control of production and distribution.

Cheese making with pasteurized milk, A. LISKA (*Milchw. Zentbl., 41 (1912), No. 16, pp. 481–485, figs. 11*).—A brief report of experiments in making Liptau, Trappist, and Edam cheese with milk pasteurized at from 65 to 68° C. for from 20 to 30 minutes. The curd was more compact and the flavor and aroma much improved over cheese made from unpasteurized milk.

Powdered milk, M. H. GAUDECHON (*Vie Agr. et Rurale, 1913, No. 5, pp. 131–137, figs. 4*).—A popular article on the characteristics and uses of dried milk. The Hat-maker and Bévenot de Neveu processes of drying are described.

VETERINARY MEDICINE.

Atlas and principles of bacteriology, K. B. LEHMANN and R. O. NEUMANN (*Atlas und Grundriss der Bakteriologie. Munich, vol 10, 5. ed., rev. and enl., pts. 1, 1910, pp. XIII, pls. 79; 2, 1912, pp. XIV+777, figs. 32*).—This well-known book has been entirely revised and enlarged.

Further observations upon certain sources of error in the opsonic technique, E. GLYNN and L. COX (*Jour. Path. and Bact., 16 (1912), No. 3, pp. 283–286, fig. 1*).—"The amount of phagocytosis and of experimental error is practically the same whether the opsonic pipette is stationary during incubation or rotated

once every 2 minutes; but when it is rotated once every half-minute or less the amount of phagocytosis definitely diminishes, and the experimental error increases. This is contrary to the conclusion arrived at by Rosenow (1906).[a] His phagocytic mixtures, however, were shaken, not rotated.

"There is a diminution, about 10 per cent, in the phagocytic capacity of leucocytes which have been allowed to stand in normal saline at the room temperature for 2 hours, and a marked increase in the amount of experimental error. The diminution in phagocytic capacity upon standing is similar to that observed by us on a previous occasion (1909). An emulsion of staphylococcus in normal salt solution, standing in a tube of 6 mm. diameter, does not settle appreciably in 2 hours, and the experimental error is not diminished by constant stirring of the emulsion."

Contributions to the biology of the male sexual cells.—II, The sexual specific toxicity of the testicular antiserum, E. GRÄFENBERG and J. THIES (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 12 (1912), No. 6, pp. 678–694*).—The authors found that an antiserum obtained by injecting male rabbits with testicle extract from guinea pigs is as toxic for male animals as the extract from these organs, and is more toxic for males than for females. This difference in toxicity can be produced by either injecting testicle extract from the same kind of animal or from other animals. It is also possible to produce an antiserum by injecting a spermatic fluid into a rabbit, which is more toxic for male guinea pigs. The different behavior of the sperm antiserum may possibly serve as a basis for a biological sex reaction.

Contribution to our knowledge of the toxins contained in Bacillus erysipelatis, H. J. VAN NEDERVEEN (*Beiträge zur kenntnis der im Rotlaufbazillus Enthaltenen Gifte. Inaug. Diss., Univ. Bern, 1912, pp. 62, pl. 1*).—Like some other bacteria, *Bacillus erysipelatis* contains endotoxins. In addition, extracellular toxins are present which are more or less fixed in the bacterial walls, and which, in all probability, go over into the culture medium. By washing, these substances can be removed from the bacilli, but if the bacilli are cultivated the toxins are replenished. Hemolysin formation could not be noted in vitro.

On account of the wax-like hull which this organism possesses, it has a great resistance toward leaching by such preparations as antiformin. If washed with physiological salt solution its resistance is somewhat lowered.

Studies of the bacillus of Schmorl (*Ann. Inst. Pasteur, 26 (1912), Nos. 8, pp. 625–634, figs. 3; 10, pp. 802–816; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 339–342*).—The first memoir, by E. Césari and V. Alleaux, deals with the pathogenic rôle, morphology, culture, and isolation of the bacillus of Schmorl or necrosis bacillus; the second memoir, by E. Césari, with experiments upon the guinea pig, including subcutaneous, intravenous, and intraperitoneal injections.

This organism was first observed by Loeffler in calf diphtheria in 1884, but the authors think that the researches carried out by Schmorl in 1891 should take precedence in connection with its nomenclature.

The authors give a summary of the more important conditions to which the bacillus gives rise in the horse, ox, sheep, pig, dog, and rabbit. Exceptionally the organism may be responsible for lesions in other species of animals, and it has been found in lesions in the human subject. In general the lesions caused by the bacillus of necrosis are as follows: Invasion of external tissues produces lesions of a necrotic, gangrenous, or suppurative nature; in mucous membranes the lesions produced are in reality of a gangrenous or sometimes of

[a] Jour. Infect. Diseases, 3 (1906), No. 4, pp. 683–700, pl. 1.

a suppurative nature, although often incorrectly termed diphtheritic; and in the viscera the lesions are either in the nature of pure necroses or abscesses. The bacillus is capable of producing either necrosis or gangrene in external tissues or mucous membrances.

Permeability of filters by micro-organisms, J. F. HEYMANS (*Bul. Acad. Roy. Med. Belg., 4. scr., 26 (1912), No. 2, pp. 89–101; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 5 (1912), No. 14, pp. 341, 342*).—The filters tested were the porcelain, Bechhold's ultra, collodion, reed sack, and parchment.

At a pressure of 10 to 11 atmospheres bacteria having a size of 1 micron in diameter pass through 0.03 micron pores, and only when the pores are 0.01 and 0.02 microns in size are the bacteria retained in the filter. This ultra-diapedesis is, according to the author, due to a plasmodium-like movement which the bacteria possess.

The permeability of ultramicroscopic forms of the tubercle bacilli is also mentioned.

Observations on zinc poisoning, G. D. LANDER and J. T. EDWARDS (*Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 319–321*).—The authors' experiments to determine the effect of prolonged dosage of the ox and sheep with nonirritant zinc preparations, including zinc oxid and zinc acetate, indicate that accidental zinc poisoning will not arise in practice from the taking of the nonirritant preparations. The experiments with irritant preparations in which the double chlorid of zinc and potassium was used show that a dose of irritant zinc compounds of considerable magnitude is necessary to prove fatal. The results show a small degree of absorption and a slowness of elimination, quite a considerable proportion of zinc remaining in the liver even 3 weeks after the administration of the last dose.

Meat poisoning and food poisoning in their relationship to contamination of meat before and after death, M. MÜLLER (*Centbl. Bakt. [etc.], I. Abt., Orig., 66 (1912), No. 2–4, pp. 222–240, fig. 1; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 349–355*).—This is a report of studies made in the slaughter house laboratory at Munich.

Biological products.—Establishments licensed for the propagation and sale of viruses, serums, toxins, and analogous products (*Pub. Health Serv. U. S., Pub. Health Rpts., 28 (1913), No. 2, pp. 61, 62*).—This is a list of the establishments holding licenses issued by the Treasury Department on January 1, 1913, for the sale of the above mentioned biological products.

Variations in the inherent phagocytic power of leucocytes from donkeys immunized against anthrax, E. E. GLYNN and G. L. COX (*Jour. Path. and Bact., 16 (1912), No. 4, pp. 535–562, figs. 3*).—The difference in the inherent phagocytic power of leucocytes from various individuals in disease, and to a lesser extent when tested in vitro according to Wright's method, when compared with the control taken as unity may be expressed as an index known as the cytophagic index to distinguish it from the phagocytic index. The anthrax bacillus, *Staphylococcus albus*, and the tubercle bacillus were used for comparing the degree of inherent phagocytic power of the leucocytes from 3 donkeys immunized against anthrax with the leucocytes of a control donkey.

"Before the first examination of their blood, donkey 1 received 47 inoculations during 3½ years; donkey 2, 33 in 2 years; donkey 3, 30 in 1¾ years. Donkey 1 received the smallest doses. Donkey 1 was tested on 16 different occasions; donkey 2 and 3 on 2 occasions each.

"The staphylo-opsonic index was almost invariably normal in the 3 animals, averaging 0.97, 1.05, and 0.85, but that for anthrax was frequently above the normal and averaged 1.46, 1.09, and 1.12. The rise for anthrax was certainly

specific in the case of donkey 1, probably also in donkey 3, and possibly in donkey 2.

"In every one of the 16 experiments with donkey 1 and in both those with donkey 3, the cytophagic index to staphylococcus was below that to anthrax. In the two experiments with donkey 2, however, the indexes were practically equal. The average staphylocytophagic index was 0.87, 1.11, and 0.86, while that for anthrax 1.18, 1.13, and 1.11. There is strong evidence of a specific preference for anthrax in donkeys 1 and 3. The results with tubercle in donkey 1 confirm this.

"Vaccination of donkey 1 with living anthrax bacilli produced on both occasions an immediate and marked fall in the cytophagic index to anthrax and to staphylococcus, followed by a gradual rise, but the original position was not reached till more than 10 days later."

Carrion feeders as disseminators of anthrax or charbon, H. MORRIS (*Louisiana Stas. Bul. 136, pp. 16, figs. 6*).—This is a report of investigations conducted with the turkey buzzard, chicken, dog, hog, cat, opossum, rabbit, and house fly in order to determine whether or not they may act as agents in the dissemination of anthrax. The bulletin opens with a brief introduction by W. H. Dalrymple (pp. 2, 3).

In experiments with the buzzard no anthrax spores were found beyond the stomach, and but few in that organ, thus are not disseminated in its droppings. Anthrax spores were obtained from both the feet and beak of buzzards 48 hours after cleaning the cages in which they were kept confined, and it was also found that the buzzard can disseminate anthrax by vomiting flesh eaten from an anthrax carcass. The experiments indicate that the buzzard is capable of carrying the infection for miles after feeding upon anthrax carcasses and of starting fresh centers of anthrax where it has never previously existed.

In feeding experiments the author was unable to produce the disease in the dog, hog, cat, opossum, chicken, and rabbit, and but 3 of 21 guinea pigs to which the organism was fed contracted the disease. "Anthrax was found in the feces 144 hours, or 6 days, after feeding the spores to the dog. The virulence of the anthrax was not affected by passing through the dog, as was shown by inoculation tests upon rabbits. Cultures obtained from the feces killed rabbits just as readily as the original culture. . . . The dog is, no doubt, one of the most dangerous disseminators of anthrax infection." Anthrax was found in the feces of the hog for a period of 120 hours, or 5 days, after feeding spores, and in the feces of the cat and of the opossum for a period of 3 days after feeding spores.

Cultures made from the feces of rabbits and guinea pigs developed colonies of anthrax and showed that the spores were not destroyed in the digestive tract. In work with house flies, almost pure cultures of anthrax were obtained from the specks of flies that had fed upon a mass of anthrax spores. Anthrax spores were found to be present on the bodies and feet, as well as in the excrement, of "green bottle flies," collected while feeding on an infected carcass.

Experimental contribution on anthrax infection of birds by feeding, O. HOFHERR (*Experimentelle Beiträge zur Milzbrandinfektion des Geflügels durch Fütterung. Inaug. Diss., Univ. Giessen, 1910, pp. 31*).—Previously noted from another source (E. S. R., 24, p. 787).

On the pathogenesis of foot-and-mouth disease, J. BÖHM (*Ztschr. Fleisch u. Milchhyg., 22 (1912), No. 11, pp. 337–341, pls. 2; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 343–345*).—This paper is based upon a comparative study of the lesions found in freshly infected pigs and in those which had been diseased for some days.

About the changes taking place in the milk from cows affected with foot-and-mouth disease, J. HONICMUND (*Ztschr. Fleisch u. Milchhyg., 22 (1912), No. 6, pp. 175, 176*).—This work was done at the itinerant clinic of the Royal Veterinary High School at Berlin. It shows that the ash content of the milk rises during the first few days, whereas the protein content remains nearly constant and undergoes only the variations which occur under normal conditions. The increase in total solids is probably due to an increase in fat. No diminution in fat was ever noted.

Fallacies in the report of the royal commission on tuberculosis, R. VINCENT (*Sci. Prog. Twentieth Cent., 6 (1912), No. 24, pp. 507–513, pl. 1*).—This is a critical discussion of the findings of the royal commission on tuberculosis (E. S. R., 25, p. 884; 26, pp. 884, 885, 886).

Some observations in regard to the combined conjunctival and subcutaneous tuberculin test for detecting bovine tuberculosis, L. OPALKA (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 11 (1912), No. 5, pp. 388–400*).—In the tests reported positive results were not always obtained when the conjunctival and subcutaneous tests were conducted at the same time. The greatest number of results which agreed were obtained when a uniform tuberculin was used in the tests. The ophthalmo reaction seems to be the most reliable test but a preceding ophthalmo reaction never influences a superseding thermo reaction. If the tests are conducted in the reverse manner the appearance of the opthalmo reaction is hindered.

Treatment of bovine tuberculosis, N. S. MAYO and W. KERR (*Virginia Sta. Bul. 199, pp. 3–23, figs. 6*).—This bulletin deals chiefly with the methods used in eradicating tuberculosis from the college herd, as previously reported (E. S. R., 27, p. 482), together with notes on the cause, symptoms, spread, and treatment of the disease.

"An experiment lasting 3 years, 'to determine whether or not an attempt at curative treatment of tuberculosis would be practicable as an adjunct to the eradication of the disease from dairy and breeding herds,' gave negative results. Twenty cows and 1 bull, all of whom had reacted to the tuberculin test, were used in this experiment. One group of animals was kept in a close, dark, unsanitary basement barn and not well fed or cared for. Another group was kept in a well-lighted, well-ventilated, sanitary barn, fed highly nourishing food, and given special care. Each animal in the third group, treated like the preceding, was kept in a separate stable and paddock, so that if cured by the hygienic treatment, the disease could not be contracted again from other animals. Four cows died of tuberculosis during the experiment, all from the 2 groups receiving the best care. After 3 years the remaining animals were slaughtered. Post-mortem examination did not indicate that the disease had been checked.

"The 'Bang system,' which consists of isolating reacting animals, taking their calves away at birth, and with them building up a new, healthy herd, proved to be financially impracticable in this experiment. The expense and inconvenience of maintaining a separate herd, and the constant danger of reinfection of the healthy herd from this source, are too great to make the method practicable except, possibly, with very valuable pure-bred animals."

A form of treatment is recommended.

Combating bovine tuberculosis, H. C. F. L. WARNECKE (*Der Kampf Gegen die Tuberkulose unter dem Rindvieh. Inaug. Diss., Univ. Bern, 1911, pp. 89*).—This is a critical review of the work done in regard to combating tuberculosis among cattle.

It is maintained that for the rational combating of this disease, all animals having open or clinical tuberculosis should be destroyed. The term "open tuberculosis" should be termed "clinical tuberculosis" in the statutes.

Milk intended for consumption should be heated to 80° C. Ostertag's system should be employed for combating the disease.

Tests with antiphymatol, ROTHENBACH (*Schweiz. Arch. Tierheilk., 53 (1911), No. 4, pp. 153–165; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 44, p. 807*).—Tests were made with this vaccine against tuberculosis and favorable results were obtained. According to the author, the vaccine is the best of those known at the present day for combating tuberculosis, and with it it is possible to save herds which are strongly infected.

Comparative investigations in regard to the utility of the catalase, reductase, and leucocyte tests for detecting mastitis milk, O. GRATZ and A. NÁRAY (*Milchw. Zentbl., 41 (1912), Nos. 8, pp. 225–232; 9, pp. 257–263; 10, pp. 289–303; abs. in Chem. Zentbl., 1912, II, No. 4, p. 287*).—The milk coming from 153 animals was examined by the catalase test (Koestler's apparatus being used with 10 cc. of milk and 5 cc. of fresh hydrogen peroxid at 22 to 24° C. and allowed to stand for 2 hours); reductase, using Barthel's methylene blue reagent with 20 cc. of milk; and Schardinger's formaldehyde-methylene blue test. The cases of streptococcic mastitis which were detected are described.

The results show that the catalase test is an even more sensitive indicator than the Trounsdorff's leucocyte test, and this is particularly the case in those instances where only a small amount of sediment is obtained. Notwithstanding this, it is always necessary to make the leucocyte test in conjunction with the catalase test, for the purpose of determining whether or not the catalase is due to the presence of minute amounts of blood in the milk. With the catalase test the presence of from 5 to 10 per cent mastitis milk can be detected.

The reductase test conducted with both the methylene blue and methylene blue containing formaldehyde is unreliable.

Investigations in regard to the influence which the number of leucocytes and the products of inflammation have on the reaction of milk, J. FRICK (*Untersuchungen über den Einfluss der Leukocytenzahl und der Entzündungsprodukte auf die Reaktion der Milch. Inaug. Diss., Univ. Stuttgart, 1912; abs. in Deut. Schlacht u. Viehhof Ztg., 12 (1912), No. 45, pp. 685, 686*).—For counting the leucocytes and bacteria Slack's method was employed. The reaction of the milk was determined with a rosolic acid-alcohol mixture according to Hoyberg's specifications. Milks giving an acid reaction toward litmus were titrated with a one-fourth-normal potassium hydroxid solution.

The milks from animals affected with mastitis usually had an alkaline reaction, but in the acute stages of the process an increased acidity was noted which later changed to alkalinity. In most cases there was a parallelism between the leucocyte count and the bacterial content.

Colostrum was always found to be acid in reaction toward litmus paper. The leucocytes and the presence of blood serum had no relation to the acidity.

Milks from old lactating pregnant cows were alkaline and had an increased leucocyte content. Nonpregnant animals showed no variation from the normal.

Further observations on Onchocerca gibsoni, the cause of worm nodules in cattle, J. A. GILRUTH and GEORGINA SWEET (*Proc. Roy. Soc. Victoria, n. ser., 25 (1912), No. 1; Queensland Agr. Jour., 29 (1912), No. 5, pp. 433–439*).—This paper presents additional information (E. S. R., 26, p. 183) on the original home and host, the history of its occurrence, the geographical distribution in Australia, and the means of transmission of this parasite. The authors think that the intermediate host is very probably a fly.

An important newly recognized parasitic disease of sheep, B. H. RANSOM (*Abs. in Science, n. ser., 37 (1913), No. 941, p. 78*).—Reports received from federal meat inspectors that a considerable number of sheep were found on

post-mortem inspection to be infested with tapeworm cysts led to the investigation here reported.

The cysts were located in the musculature and were at first thought to be *Cysticercus cellulosæ*, but the fact that from 1 to 4 per cent of the sheep killed at some establishments were infested indicated that this was not the case, as *C. cellulosæ* is very rare in its normal host, the hog, in this country. Microscopic study showed that the form found in sheep was similar to but nevertheless distinct from *C. cellulosæ*. The cysticerci from the meat of sheep were fed to 5 dogs, and *C. tenuicollis*, which also occurs in sheep, to 2 dogs. All of the dogs developed tapeworms, but those of the 5 dogs were distinct from those of the 2 fed *C. tenuicollis*. Six sheep were then fed tapeworm eggs from the tapeworms of the 5 dogs, and 2 were fed eggs of the *Tænia hydatigena* produced in 2 dogs from the feedings of *C. tenuicollis*. All sheep fed with eggs from the tapeworms of the 5 dogs receiving muscle cysts developed cysts in the muscles, but no *C. tenuicollis;* both sheep fed eggs of *T. hydatigena* developed *C. tenuicollis*.

The new cysticercus is said to be a source of considerable loss to western sheep men and warrants careful prophylactic measures, such as the destruction of carcasses of dead sheep and the employment of vermifuge treatment for dogs.

Invasion of animal parasites by bacteria, Lucie Friedrich (*Ztschr. Infektionshrank. u. Hyg. Haustiere, 12 (1912), No. 4, pp. 385, 386; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, p. 361*).—The unexplained results often observed during the process of testing swine erysipelas serum on mice, in that animals receiving large doses of serum died of swine erysipelas while those receiving smaller doses survived, led to the investigations here reported.

Sixteen of 38 mice which died after receiving a dose of from 0.01 to 0.015 cc. of serum and 0.01 of culture, were found to be the hosts of *Cysticercus fasciolaris*. "Microscopic examination showed that in every case large numbers of swine erysipelas bacilli were present in the scolex and in the fluid contained in the cyst, and the organism could be obtained from these in pure culture. Mice which were infected with the bacilli cultivated in this way died of swine erysipelas in 2 days. In one case a cysticercus was triturated with 2 cc. of physiological salt solution, 1 cc. of which was injected into a mouse. Death occurred from swine erysipelas on the third day." It is stated that further investigations are necessary to determine whether the bacilli multiply within the parasite and reinfect the host.

Two specimens of *C. fasciolaris* were found in the liver of a white mouse which had died from strangles within 4 hours after having been inoculated with the strangles streptococcus. Microscopic examination showed that the parasites contained streptococci, but there was a marked decrease in their virulence. In another case strangles streptococci cultivated from a cysticercus had completely lost their virulence.

[Experimental work on hog cholera], R. A. Craig (*Indiana Sta. Rpt. 1912, pp. 79, 80*).—It has been found that by the use of virulent salt solution (E. S. R., 24, p. 684) for hyperimmunizing hogs as potent a vaccine can be produced as with blood. The amount of virulent salt solution injected intramuscularly was 30 cc., and intravenously 16 cc. per pound of body weight.

In the inoculation of pigs with blood, urine, and filtered and unfiltered virulent salt solution from cholera hogs, 9 pigs receiving 2 cc. of blood lived on an average 9 days and had an average maximum temperature of 107° F.; 8 treated with 2 cc. of urine lived 12 days with a maximum temperature of 105.2°; 10 received 2 cc. of virulent salt solution and lived 13 days with a maximum temperature of 106.8°; 14 animals injected with virulent salt filtrates

lived 23 days and showed a maximum temperature of 107.2°; and finally 7 animals in a pen exposure test lived 22 days and showed a maximum temperature of 107.5°.

Results of studying the blood and physiological salt solutions from cholera hogs and filtrates of these virulent materials with the dark field illumination apparatus are reported. "An organism has been observed clinging to the margins of the blood cells. This organism was present in all of the specimens of hog cholera blood examined, but it was not found in blood from healthy pigs and hyperimmune hogs, excepting one hog that had been recently hyperimmunized. It was not observed in specimens of blood from cows, calves, and sheep. Roundish, motile organisms were also uniformly present in blood, urine, physiological salt solutions from cholera hogs, and their filtrates. These 2 forms of organisms undoubtedly bear a close relation to hog cholera, but proof of the fact that they are the direct cause of the disease has not yet been secured because of the fact that it has thus far been impossible to isolate them."

Because of the apparent satisfactory results following the use of a virulent blood vaccine in hog cholera outbreaks in an adjoining State, experiments were made with it. Cholera blood was placed in a water bath from 30 minutes to 2 hours and heated to temperatures varying from 51 to 60° C. Twenty-five pigs were inoculated with the experimental vaccine, and 3 fed tablets of the dried vaccine. No immunity was conferred, as all but 2 of the experimental pigs died when inoculated with virulent blood or given pen exposure.

About hog cholera, S. Löwensohn (*Illus. Landw. Ztg., 33 (1913), No. 3, pp. 14–16*).—In a herd consisting of 1,030 pigs, hog cholera was noted on August 22 and 23, 1912. In this herd 539 living pigs were born up to October 22. Vaccinations were made according to Hutyra's method, with Suptol-Burow, and with an antihog cholera serum commercially known as "Neu." On the basis of the tests Hutyra's serum was given the preference.

The occurrence of swine plague and the results obtained with Suptol-Burow, P. Reimers (*Das Auftreten der Schweineseuche im Kreise Syke und Erfahrungen mit der Anwendung des Suptol-Burow. Inaug. Diss., Univ. Leipsic, 1912, pp. 47; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 44, p. 807*).—It is believed that the so-called pox of hogs is a form of urticaria, viz, *Urticaria bullosa*, and that many of the cases described as such are in reality cases of swine plague, the urticaria simply being a symptom of that disease. The eczema of shoats is also a symptom of swine plague. Suptol-Burow is considered the only efficient treatment against swine plague which we possess at the present time.

In regard to vaccinating against swine plague, C. C. Svansö (*Maanedskr. Dyrlæger, 24 (1912), No. 13, pp. 406–409; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 47, p. 881*).—Out of 23 shoats 19 were treated with Gans' polyvalent swine plague serum and bacillary extract (germ free) made from the swine plague organism. The remaining 4 animals were kept as controls. Two of the controls died and 6 of the vaccinated animals.

The results obtained by vaccination are not deemed commensurate with the expenses involved.

Studies in canine distemper, J. C. Torrey and A. H. Rahe (*Jour. Med. Research, 27 (1913), No. 3, pp. 291–364, pls. 10, fig. 1*).—"The evidence on which we rest the claim that *Bacillus bronchisepticus* is the essential primary etiological factor in canine distemper may be briefly summarized as follows:

"*B. bronchisepticus* is the only cultivatable micro-organism present with uniformity and in great numbers in the tissues and organs of cases of canine distemper. It may be found in the trachea and frequently in the nose during

the incubation and earliest stages of the disease and is readily recovered, often in pure culture, from the respiratory tract, liver, and spleen in fully developed cases. It is encountered more rarely in the blood and kidney.

"Typical distemper may be induced in susceptible dogs by infection, under carefully controlled conditions, with pure cultures of *B. bronchisepticus*, utilizing methods simulating natural modes of transfer of the disease and the bacillus may be recovered in pure culture from the organs of such experimental cases.

"Dogs which have recovered from attacks induced by this bacillus are protected on exposure to natural distemper, and susceptible dogs, actively immunized by subcutaneous injections of small doses of this bacillus, become immune to natural distemper."

A list of 39 references is appended.

A leucocytozoon of the ostrich, J. WALKER (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 4, pp. 372–375, pl. 1; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 360, 361*).—The loss in the Middelburg district of Cape Colony of a high percentage of ostrich chicks led to the investigations here reported.

Examinations of the blood of diseased chicks revealed the presence of a leucocytozoon. Numerous examinations of the blood of wild birds revealed the presence of parasites of this kind only in the blood of certain types of hawks, and they were consequently thought to be of a slight economic interest. It was found that the leucocytozoon does not occur in old ostriches, the youngest chicks found to be infected being 4 weeks old and the oldest 7 months. The deaths did not occur at all farms, and, as the presence of the leucocytozoon was not demonstrated on all farms, it is said to be impossible to state at the time of writing that this parasite was the cause of the disease. The name *Leucocytozoon struthionis* is given to this parasite.

RURAL ENGINEERING.

Hydraulic rams, M. RINGELMANN (*Ann. Min. Agr. [France], 1909, No. 40, pp. 35–44*).—This article reports general investigations of the hydraulic ram, quoting manufacturers' data for installations to fit various conditions, and giving a list of rams already in operation in France. The tabulated results of 140 tests are given to determine the size, length, and fall of drive pipe, and the size, length, and lift of delivery pipe best suited to various sizes of rams for highest efficiency.

In 7 of the tests efficiencies of from 80 to 87 per cent were obtained, but the majority of efficiencies ranged between 40 and 70 per cent.

The horsepower of a pipe line, R. S. BAYARD (*Power, 36 (1912), No. 27, pp. 963–965, fig. 1*).—This article deals with the relation between static and friction heads, flow, and velocity, and gives the results of experimental work to determine the proper velocity and flow to obtain the maximum efficiency from a pipe line of given size with a given static head.

The resulting curves show that for a 16 in. pipe line 6,000 ft. long with a total static head of 450 ft. the maximum horsepower is about 447, which occurs when the friction head is about 155 ft. or about one-third of the total head. The conclusion is drawn that the maximum efficiency is available in a given pipe line when about one-third of the static head is sacrificed to friction.

State Rivers and Water Supply Commission. Fifth annual report (*Victoria Rivers and Water Supply Com. Ann. Rpt., 5 (1910), pp. 35*).—This reports the extent and condition of water supplies for irrigation and for public and private use for the year 1909-10, and submits estimates for the ensuing year.

Considerable data are included relative to areas of different kinds of crops watered, lands and communities supplied with water within the State, and stream gagings.

Georgia drainage law (*Savannah, Ga., 1911, pp. 24*).—The text of an act authorizing the establishment of drainage districts in Georgia for the reclamation of swamp lands and providing for the assessment and collection of the cost thereof is given.

Drainage and soil aeration, A. E. Parr (*Agr. Jour. India, 7 (1912), No. 4, pp. 371, 372*).—In drainage experiments the upper ends of lateral drains were connected by tubes with the outer air, thus obtaining thorough ventilation of the drains and causing aeration of the surrounding soil by the escape of air through the sides of the drains. Decidedly better crops were yielded from plats so drained than from plats in which the drains were not connected with the air.

The traffic census as a preliminary to road improvement (*Engin. and Contract., 39 (1913), No. 4, pp. 94–97*).—This is a paper presented by W. D. Sohier at the Third American Good Roads Congress at Cincinnati, in which he discusses the uses of a traffic census and gives considerable information and data from the experimental work of the Massachusetts Highway Commission with certain materials and kinds of construction and maintenance under different kinds of traffic. The following conclusions are drawn as to the effect of loaded farm wagon, motor truck, and automobile daily traffic on roads:

A good gravel road will wear reasonably well and be economical with from 50 to 75 light teams, 25 to 30 heavy 1-horse teams, 10 to 12 heavy 2-horse teams, and 100 to 150 automobiles, but should be oiled with over 150 automobiles. Hot oiled gravel or gravel oiled yearly with heavy cold oil in ½ gal. coatings will wear with a daily traffic of from 75 to 100 light teams, 30 to 50 heavy 1-horse teams, 20 heavy 2-horse teams, and 500 to 700 automobiles.

Water-bound macadam will stand with a daily traffic of from 100 to 150 light 2-horse teams, 175 to 200 heavy 1-horse teams, 60 to 80 heavy 2-horse teams, and not over 75 automobiles at high speed. A dust layer will improve conditions on such macadam with a daily traffic of from 50 to 100 automobiles, and should prepare it to stand as high as from 300 to 500 automobiles.

Water-bound macadam with a hot oil blanket coat will be economical with a daily traffic of from 250 to 300 light teams, 75 to 100 heavy 1-horse teams, 25 to 30 heavy 2-horse teams, and as high as 1,400 automobiles; and should stand at least 50 motor trucks, but will crumble with over 100 light teams or 50 heavy 1- or 2-horse teams hauling loaded farm wagons on very narrow tires. Water-bound macadam with a good surface coating of tar will stand a daily traffic of 30 to 50 light teams, 25 to 30 heavy 1-horse teams, 10 to 15 heavy 2-horse teams, and 1,800 automobiles.

Data for use in designing culverts and short-span bridges, C. H. Moorefield (*U. S. Dept. Agr., Office Pub. Roads Bul. 45, pp. 39, pls. 16, figs. 4*).—This bulletin, intended to further the plans outlined in a previous bulletin (E. S. R., 27, p. 190) gives definite suggestions and preliminary data for use in designing highway culverts and short span masonry bridges. The materials dealt with are vitrified clay pipe, cast iron pipe, corrugated iron pipe, stone, and especially reenforced concrete for which general specifications for proportioning, mixing, and reenforcing are given. The data given usually deals separately with the various parts of a structure, such as the floors, beams, wing walls, abutments, etc., and the assembling of these parts is left to the discretion of the designer. A few complete designs typical of common practice are shown. It is stated that the proper design and erection of such structures involve the exercise of judgment and skill, which is to be acquired only through training and experi-

ence, and that the intelligent use of the data presented must therefore necessarily be limited to engineers and experienced foremen.

In conclusion designers of highway bridges and drainage structures are urged not only to investigate the safety and durability of proposed designs, but also to consider their esthetic features, since when bridges and culverts are constructed of permanent materials, such as reenforced concrete, any esthetic defects which may be present in such structures will become more and more apparent as the community develops.

Agricultural tractors (*Bul. Agr. Congo Belge, 3 (1912), No. 2, pp. 391–405, figs. 5*).—This article gives the results of plowing, brake, and road tests of 3 steam and 4 internal combustion tractors. The best all-round efficiency was obtained from a 25 to 30 h. p. compound steam tractor, having a net weight of 5,065 kg. and 3 speeds of 3,218 meters, 4,120 meters and 8,045 meters per hour. This tractor cost 6,360 florins (about $2,500). The results in general indicate that considerable improvement could be made in all 7 tractors.

Tractor plowing tested in Australia (*Farm Machinery, 1913, No. 1109, p. 16, fig. 1*).—A report of recent plowing tests with a 30 h. p. kerosene tractor at the Roseworthy College Experiment Farm states that the tractor dragged three 8-furrow skim plows, which plowed a pasture field 3 and 4 in. deep, making a total width of 24 furrows, each 7 in. wide. The soil was rather dry and exceedingly tough. The machine did excellent work and maintained a speed of 2 miles per hour, with scarcely any delay. The fuel consumption was about 1½ gal. per acre.

A new motor plow (*Maschinen Ztg., 10 (1912), No. 15, pp. 180, 181, figs. 2*).—This novel combination of motor and gang plow is driven from the front by an unsupported 4-cylinder gas engine by a shaft drive to two large drive wheels of from 2 to 2½ meters in diameter. The drivers' rims are equipped with shovel points to prevent slipping while at work, these being thrown flat against the rim when traveling over a hard road. The greater part of the weight, including the plow, frame, and operator is behind the drivers, counterbalancing the motor in front, and supported at the rear by a single wheel, which also serves as a steering wheel. The plow has 6 shares so arranged on a separate frame that it can be raised and lowered to the required depth exactly parallel to the ground. The entire machine is controlled by wheels and levers from the operator's seat, which is directly over the plow.

[Comparison of the relative economy of steam and electricity for threshing], J. Charbonnier, Jr. (*Maschinen Ztg., 10 (1912), No. 15, pp. 177–180*).—This article deals with the relative economy of steam and electricity for threshing by reviewing the results of several experiments and tests conducted with various machines. Results are given from the use of ordinary sized threshers having cylinders from 1.53 to 1.68 meters long and 0.56 meter in diameter, and of extra large threshers with cylinders from 1.68 to 1.71 meters long and from 0.71 to 0.75 meter in diameter.

The ordinary sized machines had an average threshing capacity of about 30 cwt. of grain per hour, and the extra large sized machines a capacity of about 50 cwt. per hour. For driving the ordinary sized threshers steam engines of from 22 to 28 h. p. or electric motors from 30 to 35 h. p. were required; and for the extra large threshers engines of from 32 to 45 h. p., or electric motors of from 45 to 50 h. p. were required.

The first costs of the engines were from 25 to 30 per cent higher than those of the electric motors, but the cost of operation of the motors, including a suitable percentage for maintenance, repairs, and depreciation, were found to

average from 10 to 15 per cent greater in a year's work. Additional results are shown in the following table:

Relative cost of threshing with steam and electricity.

Quantity of grain threshed.	No. 10-hour working days per year.		Cost per hundredweight.			
			Steam.		Electricity.	
	Ordinary sized thresher.	Extra large thresher.	Ordinary sized thresher.	Extra large thresher.	Ordinary sized thresher.	Extra large thresher.
Cwt.			*Cents.*	*Cents.*	*Cents.*	*Cents.*
10,000	33	20	11	12	12.8	13.2
15,000	50	30	9.8	10	11.5	11.5
20,000	67	40	9.2	9.2	11	10.7
25,000	83	50	8.8	8.7	10.5	10.3
30,000	100	60	8.6	8.3	10.4	10

From these results it is recommended that for threshing a yearly amount of grain from 15,000 to 25,000 cwt. a steam threshing outfit of the ordinary size type be used, and for quantities of grain above 25,000 cwt. per year a steam driven thresher of the extra large size type.

Farm poultry house construction, H. L. KEMPSTER (*Missouri Sta. Bul. 107, pp. 59–90, figs. 35*).—This bulletin deals with the design and construction of poultry houses, including the arrangement of the interior fittings, and emphasizes simplicity and economy in construction, perfect dryness, good light, and ventilation, with due regard to comfort, as the essential features of a poultry house. It also deals with arrangement of pastures and pens. The advantages and disadvantages of the intensive and extensive or portable colony house systems of poultry keeping are pointed out, and it is stated that the most healthful and economical method of raising young chickens is by the portable house system. Several pen arrangements and designs of poultry houses to suit both systems of poultry keeping, with designs of interior fittings, are submitted, including brood and colony houses, breeding pens, and runs, roof, floor, and foundation designs, the open front poultry house, and several other simple arrangements to facilitate the work of caring for the flock, and also provide efficient lighting and ventilation.

Sanitary horse troughs, F. W. FITZPATRICK (*Sci. Amer., 107 (1912), No. 25, p. 531, fig. 1*).—This illustrates and describes a new sanitary horse trough, consisting of a bowl equipped with filling and drain valves, and supported by the drain pipe. A foot piece upon which the horse stands closes the drain valve in the bowl by means of a simple mechanism and opens the supply valve. When the horse's weight is off the foot piece the supply valve closes and the drain valve immediately opens and allows the water remaining in the bowl to escape. This arrangement is said to be convenient and sanitary, provides fresh water for each horse, and does away with the freezing of tanks in cold weather.

Small septic tanks, M. RINGELMANN (*Jour. Agr. Prat., n. ser., 24 (1912), No. 49, pp. 725–728, figs. 2*).—This article reviews the theory of sewage purification by bacterial action, and outlines the design and construction of a small experimental system of sewage treatment and disposal which has proved successful.

This system consists of 2 tanks and the filter. The first tank, for settling purposes only, has one chamber with the outlet somewhat higher than the inlet, thus destroying the current of the entering sewage and allowing the heavier

solids and mineral matter to settle and be removed at an opening near the bottom. The second tank, which receives the liquid sewage and the lighter solids from the first tank, has two chambers, in the first of which the bacterial action takes place. The second, or discharge chamber, is only about one-half the size of the receiving chamber. Both inlet and outlet and the connection between chambers are provided with elbows extending below the water level to prevent disturbance of the surface scum. The settling tank is cylindrical and is made from 0.4 meter to 0.5 meter in diameter, and about 0.6 meter in depth. Both chambers of the septic tank are also cylindrical and the receiving chamber is given a capacity sufficient to hold from 3 to 4 times the maximum daily water consumption.

To provide for further purification after septic action a filter is used consisting of layers of porous material, such as slag, cinders, sand, gravel, or broken brick or tile, set in a cylindrical cage, and tile drained from below to carry away the water and ventilate the filter. The filtering material is about 1.75 meters thick, and 1 sq. meter is said to purify 1 cu. meter of water per 24 hours.

RURAL ECONOMICS.

The challenge of the country, G. W. FISKE (*New York and London, 1912, pp. 283, pls. 14*).—The aim of this volume is to give the reader an intelligent comprehension of the social and economic life and conditions of rural regions and their general and related aspects. The author makes a survey of rural conditions, notes their tendencies and deficiencies, defines the special problems, and makes suggestions for their improvement. Among the subjects treated are rural resources and the country-life movement, factors that are making a new world in the country, triumphs of scientific agriculture, rural opportunities and social reconstruction, and education for country life.

The evolution of the country community, W. H. WILSON (*Boston, New York, and Chicago, [1912], pp. XVII+221*).—The most of this volume is devoted to describing average conditions and types of rural communities in the United States, and making suggestions for their improvement. The betterment of the home, farm, social, and religious conditions are objects of extended treatment. Attention is directed especially to the church, the condition of which is regarded as an index of the social and economic condition of the people, it being considered here as an institution for building and organizing country life socially and economically.

Railways and agriculture, 1900–1910 (*Bur. Railway Econ. Bul. 45, 1913, pp. 31*).—This bulletin presents a comparison of the increases in what is designated as the "plant" and output of agriculture with the increases in the "plant" and output of railways, together with a comparison of the relative productivity of the railway and agricultural industries.

It is stated that the railways of the United States comprised 206,631 miles of main track in 1900 and 266,185 in 1910, an increase of 28.8 per cent, while the improved land for the same period increased from 414,498,000 to 478,451,000 acres, an increase of 15.4 per cent. The railway output per mile—ton miles and passenger miles—increased 39.8 per cent and 56.5 per cent, respectively, while the output per acre of the 10 principal crops showed an average decrease of about 1 per cent. The output and value of the railways per thousand inhabitants—that is, the work performed and money received—increased at nearly the same rates, about 55 per cent, while the output of 5 of the principal crops, measured per thousand inhabitants, decreased from 5 to 21 per cent; but their farm value increased from 37 to 80 per cent. It is claimed that the increase in the farm value of the crops was at a greater ratio than the increase

in the price of staple commodities, it being stated, for example, that 1,000 bu. of corn in 1910 would purchase 75.7 per cent more ton miles and 87.6 per cent more passenger miles in 1910 than in 1900.

Similar data are given in tabular form for wheat, cotton, and other commodities.

Rural depopulation in southern Ontario, S. A. CUDMORE (*Trans. Canad. Inst., 9 (1912), III, No. 22, pp. 261–267*).—The author points out and discusses a number of causes which have contributed to the movement of population from the rural districts to towns and cities generally, emphasizing the fact that they have been rather economic than social. He observes that the movement has been most noticeable in what are considered the most progressive countries, and notes that in the past decade the rural population of Canada has increased 17.16 per cent, while the urban population has increased 62.25 per cent.

Special attention is given to the movement as it appears in the Province of Ontario, where there are marked decreases in a number of townships and a limited or no decrease in others, this being ascribed to nationality of population and types of farming. For example, in districts where the population is mostly English-speaking the decrease has been greatest and the population is about 30 persons to the square mile, while in French-speaking districts the decrease has been less and the density of population is about 40 persons to the square mile. The development of the fruit-growing and market-gardening industries has had the effect of checking the decline in population in some districts, and even increasing the population in others. The introduction of farm machinery is another reason assigned for decline in rural population.

Experienced farm laborers for Saskatchewan (*Farm and Ranch Rev., 9 (1913), No. 4, p. 164*).—The Department of Agriculture of Saskatchewan is bringing from Great Britain experienced farm laborers and supplying them to farmers of the Province. A fee of $25 is collected from each farmer desiring laborers, and he is subsequently reimbursed from the wages of the men employed, or by the department in case a laborer quits before he has earned this amount. Over 200 men were assisted to the Province and placed with farmers last year, and it is claimed that almost without exception they have given entire satisfaction.

Cooperative associations of farmers, J. FORD (In *Cooperation in New England, New York, 1913, pp. 85–185*).—These chapters describe and discuss the various classes of cooperative enterprises among New England farmers, showing the work and progress of each and their general effect upon the rural communities.

State loans to farmers, W. M. DUFFUS (*Wis. Bd. Pub. Aff., Adv. Sheets Agr. Settlement and Farm Ownership, 1912, pt. 1, pp. 146, pl. 1*).—This publication briefly presents a history and description of the various systems of state loans to farmers in use in New Zealand, Australia, and Canada, narrates and discusses the experience of 11 States in this country in investing their school funds in farm mortgages, describes the systems of state loans to farmers maintained by the Government of the Philippine Islands, and discusses the need for some system of long-time mortgage loans to promote development of agriculture and encourage wholesome country life in Wisconsin.

The Jewish Agricultural and Industrial Aid Society (*Jewish Agr. and Indus. Aid Soc. Ann. Rpt. 1912, pp. 64*).—This report shows in considerable detail the work of the society since its organization in 1900. For the first 4 years 302 loans, amounting to $133,880.16 were granted, while in 1912 alone the loans numbered 390 and amounted to $238,323.86. During the 13 years the society has been in business the repayments on account of farm loans have aggregated

$369,532.02, or 28 per cent of the total loaned, in addition to $109,098.13 for interest.

The material development of the Jewish farmers in the United States is attributed to the work of a system of itinerant instruction, short course scholarships, a farm labor bureau, and the cooperative credit unions.

How European agriculture is financed, H. C. PRICE (*Pop. Sci. Mo., 82 (1913), No. 3, pp. 252–263*).—This article represents the results of a personal study of the system of agricultural finance in Europe, in which the author describes and discusses the sources from which the capital is drawn and made available to the use of farmers. He classifies the sources as follows: (1) Subvention from the government; (2) saving deposits of the farmer and rural population; (3) the sale of bonds secured by mortgages on farm land.

It is noted that the working capital at the disposal of the rural banks in France which had state aid amounted to 71,000,000 francs in 1910, of which 40,000,000 francs had been advanced by the government. In Austria the provincial governments assisted in the establishment of rural banks to furnish credit for farmers and advanced loans to them without interest. In Germany the government has indirectly aided the rural banks by establishing central banks, founded on capital advanced by the government, in most cases at 3 per cent interest. The Prussian Central Bank at Berlin has a capital of 75,000,000 marks from the Prussian government and receives deposits from and makes loans to the cooperative banks throughout the kingdom.

Country savings deposits are considered the most important source, since they develop the habit of saving among all classes in the country and keep the money in the rural districts in which it is earned. There are over 600 rural banks in Germany with 1,500,000 members and deposits of $250,000,000. German farmers have over $1,000,000,000 borrowed at the present time, none of it costing more than 4 per cent interest, and in some cases as low as 3 per cent.

Attention is directed to the fact that while interest rates in general are lower in the United States than in Germany, the German farmer secures credit through cooperative organizations at two-thirds the rate ordinarily paid by the American farmer. In addition the loans are made on much more favorable terms and the time and methods of repayment are adjusted to suit the business of the farmers.

The workings of the different kinds of credit organizations are discussed and illustrated.

Agriculture (*Dept. Agr. and Tech. Instr. Ireland Jour., 13 (1912), No. 1, pp. 136–151*).—The text is here given of the plans or schemes adopted by the Department of Agriculture of Ireland for encouraging improved creamery management, providing loans to farmers for the purchase of agricultural implements and loans to members of associations of fruit growers, encouraging improvement in dairy cattle through the selection and registration of pure-bred stock, and giving technical instruction in a number of subjects.

Agricultural organization, E. A. PRATT (*London, 1912, pp. XII+259*).—The author reviews the main objects and leading principles of the Agricultural Organization Society, the economic causes that originally led to its formation, the extent to which the idea has been resorted to in other countries, and the developments in Great Britain that have preceded the plan now under way to make the organization a state-aided body, whose functions will be to assist in the general formation of agricultural cooperative associations.

English farming, past and present, R. E. PROTHERO (*London, New York, Bombay, and Calcutta, 1912, pp. XIII+504*).—This publication furnishes a historical treatise on the progress of English agriculture during a period of

about 6 centuries, showing the influence of the industry on the social and economic condition of those engaged in it, and describing the effect of the advancement of agricultural skill, the adoption of new methods, the application of new resources, and the invention of new implements in breaking up the older forms of rural society and molding them into their present shape.

The agriculture and agricultural institutions of the world at the beginning of the twentieth century, L. GRANDEAU and C. DE SAINT-CYR (*L'Agriculture at les Institutions Agricoles du Monde au Commencement du XXe Siècle. Paris: Govt., 1900–10, vol. 5, pp. VIII+644, figs. 62*).—This is another of the series of publications dealing with the agriculture of the world, previously noted (E. S. R., 19, p. 287).

[A comparison of two farms in Wisconsin], D. H. OTIS (*Hoard's Dairyman, 45 (1913), No. 7, pp. 259, 270*).—Notes and tables are given comparing a general farm keeping grade cows and grade hogs with a dairy farm keeping grade cows and pure-bred hogs.

Although $59,191 was invested in the former and $34,171.25 in the latter, and the yields per acre were larger on the former, it was operated at a loss of $1,687.89 per year and the latter at a profit of $3,900.16. The difference in profitableness of the 2 farms is attributed to (1) the difference in their operating capital, that of the former being $5,991 or only 10 per cent of the capital invested, while that of the latter is $9,721 or 28 per cent; (2) the difference in the number and quality of live stock; and (3) the difference in management, the former being operated by a manager and the latter by a resident owner.

Tables are given showing the crops grown, acreage and yields, kind, number, and value of live stock, sales, expenditures, etc.

Foreign crops, December, 1912, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 44, pp. 18*).—This circular includes the 1912–13 yields of wheat, oats, and flaxseed in Argentina; the 1911–12 crops of Uruguay; Australian wheat production in 1912–13; agricultural returns for Scotland, 1912; the Irish crops in 1912; potato and root crops of France, 1907–1912; the olive crop of Italy, 1909–1912; German crops in 1912; Austrian cereals, 1909–1912; crop yields in Bosnia-Herzegovina, 1907–1912; the 1912 cotton crop of Russia; Egyptian cotton production and exports; the 1912 wheat yield of specified countries, with comparison; specified crops of Denmark in 1908–1911; the hop crop of Germany, 1907–1912; and the cotton crop of British India, 1912.

Foreign crops, January, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 45, pp. 18*).—This circular consists of tabular summaries, by countries, of the area and production of cereals, 1908–1912, and of flaxseed, 1909–1911.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 15 (1913), No. 2, pp. 16, figs. 8*).—This number gives notes and tables covering the census report on cotton ginning, consumption, stocks, imports, and exports for the United States; number and value of live stock, January 1, 1913; estimated number, average price, and total value of farm animals in the United States, January 1, with comparisons; yearly marketings of live stock; sugar crops of Porto Rico, 1908–1912; average daily departure from the normal temperature; monthly departure from the normal precipitation; world production and consumption of bananas; monthly birth rate of domestic animals; farm value of important products; receipts of eggs at 7 leading markets in the United States, 1891–1912; farms of Asiatic Turkey; percentage of population engaged in agriculture in different countries; and the range of prices of agricultural products at important markets, together with charts illustrating the tendency of crop yields per acre.

AGRICULTURAL EDUCATION.

Progress in agricultural education, 1911, D. J. CROSBY and C. H. LANE (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1911, pp. 277–341, pls. 6*).—This is a review for 1911 of the leading features of progress in agricultural education in this country and abroad, including the educational work of this Department, the Association of American Agricultural Colleges and Experiment Stations, the National Education Association, and of the fourth session of the Graduate School of Agriculture, and of items of interest as to the different agricultural colleges, normal schools, and secondary and elementary schools.

Statistics of land-grant colleges and agricultural experiment stations, 1911, B. B. HARE (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1911, pp. 231–275*).—A compilation from official sources of general statistics, courses of study, attendance, value of funds and equipment, revenues, and additions to equipment of the land-grant colleges, and of the lines of work, revenues, and additions to equipment of the agricultural experiment stations in the United States for the fiscal year ended June 30, 1911.

Organization lists of the agricultural colleges and experiment stations in the United States, MARY A. AGNEW (*U. S. Dept. Agr., Office Expt. Stas. Bul. 253, pp. 114*).

The work of the agricultural colleges in training teachers of agriculture for secondary schools (*U. S. Dept. Agr., Office Expt. Stas. Circ. 118, pp. 29*).—This is the fifteenth report of the Committee on Instruction in Agriculture of the Association of American Agricultural Colleges and Experiment Stations, and has been previously noted (E. S. R., 28, p. 8).

[Agricultural] education in France (*New England Farmer, 92 (1912), No. 12, pp. 6, 7*).—This is based on a report by Ambassador Myron Herrick on agricultural instruction in France, made in connection with the study of agricultural finance in France previously noted (E. S. R., 28, p. 293).

Summary of a study of instruction in agriculture in rural elementary schools, B. M. DAVIS (*Nature-Study Rev., 9 (1913), No. 1, pp. 2–13*).—This is an address given before the annual meeting of the American Nature-Study Society, December, 1912, discussing 172 replies received from a questionnaire sent to teachers who are representative of successful agricultural teaching in rural schools extending over a wide range of territory and under a great variety of conditions.

Of the 155 answers to the question whether it is desirable to cover the whole subject of agriculture in an elementary way with pupils below high school or select certain topics, 57 favored covering the entire subject, while 98 preferred to confine instruction to certain topics. The answers clearly indicate that the phases of agriculture meeting with the greatest success in teaching were closely correlated with dominant local farm interests.

Out of 146 teachers, 42 use home-made apparatus, 60 use school-made, 39 use both, and 5 use some purchased. Of 142 teachers, 131 do some field work ranging from a few hours in the spring months to 5 hours a week during the school year. Definite reports of the use of experiments in their teaching were made by 135 teachers.

Farm animals stood second in the list of topics reported upon as being successfully taught. Of the 99 teachers who made use of this subject in their schools, 71 indicated how they did it—16 at school by having animals brought there, 29 by having the children make certain studies at home and reporting at school, 26 through demonstrations by teachers at various farms, 19 by means of pictures and reading to be verified at home, and 2 by demonstrations at

fairs. Judging by the application made at home and the approval of patrons all but 4 teachers regarded their work in agriculture as successful. All but 1 teacher found that instruction in other subjects was helped by correlation with agriculture. "Arithmetic, language, and geography were generally specified."

Among the difficulties mentioned in teaching agriculture "were lack of time, too many grades, too few books, too little material and apparatus, adverse attitude of patrons, course of study, long vacations interfering with garden and plat work, lack of preparation on part of teachers." Among the suggestions made regarding the course of study were "arrangement of subjects in the order which they should be taught, a summary and explanation of experiments to be performed, some scheme to meet local needs, some definite statement of correlation with other subjects, means of securing illustrative material, and sources of information on various topics."

Representative comments selected from responses to the questionnaire are also given.

Country life and the country school, MABEL CARNEY (*Chicago, [1912], pp. XXII+405, figs. 111*).—This is a study of the agencies of rural progress and of the social relationship of the school to the country community, prepared especially for farmers and country teachers.

The 12 chapters of the book deal with the farm problem and its solution, the farm home, country church, grange, farmers' institutes and agricultural press, roads and the road problem, the country school as an agency in the solution of the farm problem, consolidated country schools, leadership of the country teacher, the country teacher's problem and its attack, the training of country teachers, country school supervision, and the country life movement. The appendix contains among other things (1) an outline of a course in country school teaching for country teachers, (2) an outline of a course in rural sociology, (3) educational helps and sources for country teachers, (4) suggested problems of country school teaching for attack by individual country teachers, (5) a list of 65 movements devoted to the upbuilding of American farm life, and (6) a bibliography on country life and the country school selected from a reading list of several hundred annotations.

Education for service (*Bul. First Dist. Normal School, Mo., 11 (1911), No. 3, pp. 32, figs. 28*).—A description of what is being done in agriculture at the Kirksville, Mo., Normal School. In the reorganization of courses of study, botany becomes a division of farm and garden crops; zoology subordinates itself to the principles of stock breeding; chemistry takes practical form in a study of commercial products, permanent soil fertility, and food values; biology turns itself into a concrete study of practical bacteriology; and physiology becomes a concrete division under sanitation.

Community work of the rural high school, A. W. NOLAN (*Agr. Col. Ext. Univ. Ill. [Circ.], 1912, Sept., pp. 28, figs. 12*).—Definite suggestions are given on organizing and conducting, in connection with a rural high school, lecture courses, agricultural extension schools, farm organizations, farm picnics, arbor and farm product day, country life library association, teachers' organizations, boys' and girls' agricultural and musical clubs, extension and cooperative work among farmers, etc.

The test of efficiency in agriculture, D. P. MCALPINE (*Moderator-Topics, 33 (1913), No. 18, pp. 347–350*).—It is shown in this paper, read before the annual meeting of Michigan superintendents and school boards in May, 1912, how one teacher succeeded in interesting the boys of a high school in the subject of agriculture by taking up first the rejuvenation of an unprofitable orchard "as something likely to prove profitable financially, and as a work which would

give them some real business experience, and which would have a definite bearing on some of the courses offered in the high school." Before the work had progressed very far the students were voluntarily asking for special work in botany, animal biology, certain portions of physiography, chemistry, bookkeeping, and commercial law.

The author concludes that the test of efficiency in agriculture is "the extent to which it does what it is intended to do," whether this be to answer the money-making instinct of high school boys, to lend a purpose to high school work, or to serve as a means for concentrating various courses and for bringing the school closer to the life of the community. Agricultural instruction is regarded as effective for all of these.

Development of agricultural education in the rural schools of Ohio, FANNIE RAGLAND (*Vocational Ed., 2 (1913), No. 3, pp. 204–208*).—Four periods are established: (1) That of discussion and agitation through farmers' institutes, (2) that of the agricultural club movement, (3) that when agriculture was being introduced into the schools, and (4) that of legislation. It is claimed that the desirability of introducing agriculture into the rural schools was recognized as early as 1882.

Rural school problems with special reference to agriculture, H. B. DEWEY (*Northwest Hort., 25 (1912), No. 7, pp. 176–178, fig. 1*).—In this address the author discusses the status of the rural school with special reference to agriculture, to show first what has been accomplished, and second what remains to be done, in the State of Washington.

Agriculture in Indiana schools, G. I. CHRISTIE (*Ann. Rpt. Ind. Corn Growers' Assoc., 12 (1912), pp. 39–43, figs. 3*).—The value and some of the advantages of agriculture as a study are stated.

Agricultural courses for secondary schools, C. W. PUGSLEY (*Univ. [Nebr.] Jour., 8 (1911), No. 3, pp. 43–46*).—This presents the status of secondary instruction in agriculture in Nebraska, and outlines courses in agriculture which may be given in the different grades with trained and untrained teachers.

Use of equipment and material in agricultural teaching, G. A. BRICKER (*Texas School Jour., 30 (1912), No. 4, pp. 9–11*).—This gives a list of apparatus and materials that may be used in the teaching of agriculture and some other sciences in the public schools, with suggestions for their cooperative use.

Helps for teachers in agriculture and domestic science (*Bul. Purdue Univ., 13 (1912), Nos. 1, pp. 4; 3, pp. 6*).—An outline is given suggesting phases of agricultural and home economics work that may be taken up by schools from September to December.

Agricultural institutes for teachers of Porto Rico (*Mayaguez, P. R.: Col. Agr., 1912, pp. 33; [1912], pp. 22*).—Syllabi of lessons in agriculture and home economics, for the instruction of teachers, are given.

Home economics recipes, MARY B. VAIL (*Univ. Cal. Syllabus Ser., 1912, No. 35, pp. 22*).—A collection of recipes.

Lessons in cooking through preparation of meals, EVA R. ROBINSON and HELEN G. HAMMEL (*Chicago: Amer. School Home Econ., 1912, pp. XIII+467, pls. 15, figs. 11*).—This is a correspondence course to teach the art of cooking in the home through a series of graded menus.

Cooking course, I, AMELIA A. COOKE (*Hampton, Va.: Normal and Agr. Inst., 1912, pp. 23*).—This bulletin contains rules for the work, directions for measuring, classification of foods, recipes, serving, etc.

Course IV—cooking: Fruits and vegetables, N. S. KNOWLES (*Iowa State Col. Agr. Ext. Circ. 23, 1912, pp. 12*).—This circular, prepared for the use of girls' clubs, contains recipes and data on nutritive value.

Canning of fruits and vegetables, T. H. McHatton (*Bul. Univ. Ga., 1912, No. 191, pp. 20, figs. 7.*)—Directions for canning and preserving various fruits and vegetables are given.

The preservation of food in the home, I, II, III, Flora Rose et al. (*Cornell Reading Courses, Food Ser., 1912, Nos. 4, pp. 257–279, figs. 8; 5, pp. 281–296, figs. 3; 6, pp. 297–320, figs. 4*).—Parts 1 and 2 comprise studies of why foods spoil, how to prevent them from spoiling, and the preservation of foods by means of high and low temperatures, preservatives, and the removal of moisture. Part 3 contains the following articles: Preservation of Eggs by E. W. Benjamin, Suggestions for Keeping Fruit in the Cellar by C. S. Wilson, Preservation of Vegetables by P. Work, The Keeping of Meats by A. Boss, and the Care of Milk by W. A. Stocking.

Domestic science in rural schools, Iva Scott (*West. Ky. State Normal Bul. 1 [1912], pp. 28*).—This is an outline of work in cookery for girls' clubs.

Choice and care of utensils, Ida S. Harrington (*Cornell Reading Courses, Farm House Ser., 1912, No. 5, pp. 17–40, figs. 6*).—This bulletin treats of points to be considered in the choice of utensils, their arrangement, preparation for use, and care.

Kitchens, Elma P. Foulk (*Agr. Col. Ext. Bul. [Ohio State Univ.], 1912, Aug., pp. 16, figs. 8*).—This bulletin is intended to help in the intelligent planning of a kitchen, considering such points as sanitation, convenience, and beauty in connection with location, size, and furnishings.

Rules for cleaning, Mary U. Watson (*Cornell Reading Courses, Farm House Ser., 1912, No. 4, pp. 321–340, figs. 2*).—Detailed directions are given.

Sewing—ornamental stitches, hats, and hat making, N. S. Knowles and Louise H. Campbell (*Iowa State Col. Agr. Ext. Circ. 24, 1912, pp. 17, figs. 16*).—This gives instructions prepared for the use of girls' clubs.

Idaho sewing contest clubs, Alba Bales (*Col. Agr. Univ. Idaho Ext. Bul. 2, 1912, pp. 7*).—This bulletin outlines the plan and work for the first sewing contest in Idaho.

Ornamental and vegetable planting on the school grounds, C. R. Phipps (*Kans. State Normal School Agr. Bul. 1, 1912, pp. 14, figs. 2*).—This bulletin is designed to help those teachers who have not had opportunity for study in school gardening and landscaping. It emphasizes in ornamental plantings beauty, utility, good position, and harmonious color, and in school vegetable gardens taste in arrangement, size, and utility.

Hotbed construction and management, A. E. Wilkinson (*Cornell Reading Courses, Veg. Gard. Ser., 1912, No. 1, pp. 45–60, figs. 20*).—The author outlines some of the advantages of the hotbed in the home garden and gives advice as to its location, construction, preparation, and management.

Nature study, H. L. Kent (*N. H. State Normal School, Keene, Nature Study Bul., 1911, pp. 7–51, figs. 8*).—In addition to methods in nature study, this bulletin offers lesson plans for seed testing, apple tree studies, civics and health, studies in evaporation, condensation, solution, and well-known chemicals.

Industrial clubs and contests (*Indiana Sta. Circ. 38, pp. 24, figs. 5*).—In addition to summarizing the advantages of contests to boys and girls, this circular contains suggestions concerning organization and rules that should govern the clubs, together with outlines of contests in bread making, raising and canning tomatoes, sewing, poultry raising, and potato and apple growing.

Proceedings of the Conference on Agricultural Education for Dependent and Delinquent Boys (*New York: Child Welfare Com., 1912, pp. 44*).—An account of this conference has been given (E. S. R., 26, p. 498).

The farmers' institutes and extension work in the United States, 1911, J. HAMILTON (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1911, pp. 343–388*).—This is the annual report of the Farmers' Institute Specialist of this Office for 1911, concerning the work of the Office in promoting farmers' institutes and the development of the farmers' institute movement in the different States and Territories. It includes, among other things, an outline of the methods of teaching agriculture by correspondence, extension agencies, an account of the institutes for women and young people, exhibits at fairs, the principal points of progress by States and Territories, an account of the annual meeting of the American Association of Farmers' Institute Workers, and statistical tables showing the number of institutes held, attendance, funds appropriated, cost, and number of lecturers employed.

Farmers' institutes of Ontario, 1912–13 (*Rpt. Farmers' Insts. Ontario, 1912, pt. 2, pp. 54*).—This is a report on the meetings and statistics of membership, attendance, papers and addresses, etc.

Agricultural work in Ontario, C. C. JAMES (*Com. Conserv. Canada Rpt., 2 (1911), pp. 24–49*).—This address, delivered January 17, 1911, gives an account of the development and present status of county agricultural extension work in Ontario.

Women's institutes of Ontario, 1912 (*Rpt. Women's Insts. Ontario, 1912, pt. 1, pp. 179, figs. 56*).—This report comprises the proceedings of the annual convention held in November, 1911, selected papers, etc.

MISCELLANEOUS.

Annual Report of the Office of Experiment Stations, 1911 (*U. S. Dept. Agr., Office Expt. Stas. Rpt. 1911, pp. 388, pls. 15*).—This includes the usual report on the work and expenditures of this Office for the fiscal year ended June 30, 1911, and of the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam; statistics of the agricultural colleges and experiment stations for 1911, noted on page 691; and reviews of the progress of agricultural education and farmers' institutes and extension work, abstracted on pages 691 and 695.

Twenty-fifth Annual Report of Indiana Station, 1912 (*Indiana Sta. Rpt. 1912, pp. 90*).—This contains the organization list, reports of the director and heads of departments, of which a portion of those of the horticulturist and veterinarian are abstracted elsewhere in this issue, and a financial statement for the federal and miscellaneous funds for the fiscal year ended June 30, 1912, and for the state funds for the fiscal year ended September 30, 1912.

Twenty-first Annual Report of Oklahoma Station, 1912 (*Oklahoma Sta. Rpt. 1912, pp. 47, figs. 4*).—This contains the organization list, a report of the director on the work and publications of the station for the year, a financial statement for the fiscal year ended June 30, 1912, departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue, and a reprint of an article previously noted (E. S. R., 26, p. 511).

Director's report for 1912, W. H. JORDAN (*New York State Sta. Bul. 356, pp. 517–563*).—This contains the organization list and a review of the work and publications of the station for the year, with an epitome of some of the results of its earlier work and a discussion of the needs of the station.

A guide to the experimental farms and stations, 1912 (*Ottawa: Govt., 1913, pp. 162, figs. 52*).—This publication describes the location and equipment of the various Canadian experimental farms and the principal lines of work under way.

NOTES.

California University.—A summer traveling practice course in citriculture is being offered, beginning May 15 at Fresno and continuing 6 weeks. In the future the course will be given at the close of the sophomore year, as its primary object is to give a comprehensive view of the industry as a whole, with a view to aiding the student to a decision as to further specialization. This year seniors and juniors are also admitted, but the total number is restricted to 15 men. Visits will be made to the principal citrus districts of the State, with detailed studies of a number of typical properties. Students will also participate as opportunity offers in the actual work of the regular operations under way on the various estates.

Illinois University and Station.—Recent appointments include Dr. William Trelease, formerly Engelmann professor of botany in Washington University and director of the Missouri Botanical Garden, as head of the department of botany, and Martin J. Prucha, of Cornell University, as assistant professor of dairy bacteriology and assistant chief in that subject.

Connecticut College and State Station.—B. G. Southwick, formerly of the Massachusetts Station, has been appointed instructor in agronomy in the college. G. L. Davis has been appointed a chemist in the State Station.

Georgia College and Station.—R. J. H. DeLoach, professor of cotton industry in the college, has been appointed director of the station beginning July 1. It has been decided to abolish the poultry department at the close of the year.

Iowa College and Station.—The legislature has passed a bill providing a tax levy of ½ mill for the further equipment and support of the various activities of the college and station. This levy is expected to yield $377,500 per annum during the next 2 years, and is in addition to an annual appropriation of $150,000 for new buildings.

Of the increases thus provided, $125,000 per annum is for the support of the main college departments; $20,000 for 2-year and 4-year courses in home economics, which are definitely continued at the institution; $40,000 for the station; $40,000 for agricultural extension work; $12,500 for noncollegiate agricultural courses; $5,000 for a veterinary practitioner's course and $10,000 for veterinary investigations; $17,000 for the purchase of an experimental farm and $2,500 for equipment; $25,000 for engineering extension work and $5,000 for the engineering experiment station; and $23,000 for the enlargement of buildings, repairs, and improvement of grounds. Supplementary bills granted $30,000 for the enlargement of the college heating plant, and $125,000 toward the erection of a chemistry building to replace the structure recently destroyed by fire.

Kansas College and Station.—A new animal husbandry barn to cost $25,000 was provided by the last legislature. The forestry substation at Ogallah was discontinued.

J. G. Lill resigned April 1 as assistant in soils to become assistant in dry farming for this Department, with headquarters at Garden City, Kans. H. H. Laude, assistant in farm crops, has resigned to become county supervisor in Marion County, Missouri.

Maine Station.—The large extent to which the problems in economic entomology must be studied in the summer months calls for a larger force of entomologists than it is feasible to employ the year round.

As an experiment, three teaching entomologists from other States have been invited to spend their summer vacations in the State, devoting their time to the respective families of insects on which they are authorities. These are Prof. Herbert Osborn, of Ohio State University, Dr. Alexander D. MacGillivray of

the University of Illinois, and Charles P. Alexander, of Cornell University. This "summer staff" has accepted the invitation, which constitutes a novel and interesting experiment in strengthening the force of investigators.

Maryland College and Station.—Director H. J. Patterson has been appointed president of the college, in addition to his present duties.

The laboratory building connected with the poultry plant was destroyed by fire April 13, together with its equipment and valuable records. The total loss is estimated at $4,000 and is covered by insurance.

Massachusetts College and Station.—Over 30 courses in agriculture, horticulture, chemistry, botany, entomology, education, economics, sociology, home economics, nature study, etc., are announced for the next session of the summer school of agriculture and country life, which is to be held from July 1 to August 2. A boys' camp, a school for rural social workers, and a conference for rural community leaders are special features. The annual school for bee keepers is to be held from May 28 to June 11, followed by a bee keepers' convention, June 11 and 12.

James C. Reed has resigned as assistant chemist in the research laboratory of the station, and Walter S. Frost has been appointed assistant chemist in the fertilizer laboratory.

Minnesota University.—A number of students in the college of agriculture were this year permitted to accept appointments in agricultural high schools for the winter course of 3 months, credit being given for their work as practice teaching.

Missouri University.—In addition to the state appropriations previously enumerated, $30,000 has been granted by the legislature for short courses, $2,500 for orchard demonstrations, $3,000 for the library, $12,000 for animal husbandry, $5,000 for dairy husbandry, $6,000 for the purchase of pure-bred stock, $3,000 for horticulture, $10,000 for agricultural laboratories, $2,000 for farm management, and $15,000 for equipment, additions to barns and greenhouses, rent of land, etc. The total appropriations for the college of agriculture are nearly double those of 2 years ago, and for the entire university represent an increase of almost half a million dollars.

Nebraska University.—The *University Journal* announces that beginning with the next school year normal training will be added to the course of study in the school of agriculture. The curriculum as a whole has been revised and the work of the senior year of the 4 years' course will hereafter consist of 3 groups, the technical, intended for the men and women who go directly from the school to farms and farm homes, the university preparatory, and the normal training. A correspondence course in soils, intended to assist high school teachers in giving instruction in agriculture, has recently been organized.

New Jersey Stations.—A law passed at the recent session of the legislature provides for the registration of brands of lime sold in the State, and their analysis by the station chemist. Another law provides for the appointment by the board of managers of the State Station of a state superintendent of farm demonstration work and of county superintendents. The salaries of the county superintendents are to be paid by the counties in which they are employed.

Recent appointments include John H. Voorhees as assistant to the chief of the extension department and specialist in agronomy, and Warren W. Oley as assistant in horticulture. Victor B. Hausknecht has resigned as assistant chemist to accept a position with the Pennsylvania State Department of Agriculture.

New Mexico College.—A new publication entitled *The College Courier* is being issued by the college for the purpose of making its facilities more fully available to the people of the State. It will also be the special organ of the boys' and girls' industrial clubs, and will be sent free to all members of these clubs.

North Carolina College Station.—A. L. Feild has been appointed assistant chemist.

North Dakota College.—In order to give the people of the State a correct impression of the work and purpose of the institution, the students equipped and operated a student-life special train for 4 days in February.

One car contained exhibits from the various college departments arranged entirely by students. The dining car was under the supervision of students in the department of home economics, who planned the menus and prepared and served the meals each day. College-grown materials were utilized to a large extent. For instance, the flour was from wheat grown on the college farm and ground in the college mill. The butter, sausage, and canned fruits were made by the students and the meats were from animals cared for by them.

A coach car contained a moving-picture show operated by students, and another car was converted into a newspaper office, where an hourly paper, called the *N. D. A. C. Student Special*, was issued under the guidance of a senior in the agricultural course. Other college organizations gave entertainments at the various stations.

Oklahoma College and Station.—The extension work of the college is steadily increasing in importance. All the main lines of railroads in the State are now cooperating in the work. The 1912 enrollment of boys and girls in the college clubs reached 30,317. Corn growing and judging contests were most popular, followed by work with poultry, sewing, cooking, cotton growing, canning, Kafir corn, butter making, and hog raising.

H. Benton resigned from the extension department May 1. Dr. W. P. Schuler has been appointed assistant bacteriologist, vice B. J. Clawson, resigned to accept a position at the University of Kansas.

Oregon College.—The legislature has just appropriated $25,000 annually to the college for extension and agricultural demonstration and field work. Counties having an area of 5,000 square miles or less may receive through this legislation $2,000 annually, providing the county raises a like amount for farm demonstration and field work. In the same way, counties having a larger area may receive from the State as much as $4,000 annually, and any two or more contiguous counties may unite to form a district, and thereby become entitled to the same privileges as a separate county.

The state superintendent of public instruction is also allowed $6,000 per annum to employ two assistants to supervise and promote the development of industrial work in the public schools, including such subjects as agriculture, manual training, and home economics, and to promote industrial school fairs and school garden contests in conjunction with this instruction.

Porto Rico University.—The attendance in the College of Agriculture and Mechanic Arts at the close of its first semester was 126 resident students, of whom 39 were in agriculture, 38 in engineering, 11 in household economics, and 38 in sugar chemistry. In addition to these there were 95 students in home economics classes for housewives and 24 in home economics classes for teachers. The one-week institutes for teachers which have been held had an estimated attendance of 1,169 and the poultry institutes of 1,450. There are also 75 students enrolled in the correspondence poultry classes and 1,150 in the correspondence agricultural classes. The college will conduct poultry institutes throughout the island during the next four months.

Vermont University.—A selection cutting has been made on one of the mature stands of white pine timber belonging to the university. The work was done under the direction of the state forester, and the marking and estimating was carried on by students as a part of the forestry course.

United States Department of Agriculture.—Dr. Thomas N. Carver, of Harvard University, has been appointed to take charge of the Rural Organization Service, which is being organized to carry on the work recently authorized by Congress in acquiring and disseminating information on subjects connected with the marketing and distribution of farm products. It is announced that work for the present will be concentrated on 3 main problems as follows: (1) The preparation of an inventory of existing agricultural organizations, special reference being made to those engaged in marketing farm products; (2) determinations of the ways and with what machinery the Department can best assist any rural community or group of farmers in perfecting organizations for marketing farm produce; and (3) the conducting of a careful and a critical examination of state and national laws affecting farmers' cooperative organizations.

An order approved April 28 somewhat modifies the policy of the Department with respect to the publication of its technical work. Hereafter reports of technical research designed particularly for the attention of scientists in other institutions may be published, under certain restrictions, in any scientific journal presumed to reach those scientists most satisfactorily.

The honorary degree of LL. D. was recently conferred in absentia by the University of Edinburgh upon former Secretary James Wilson.

Director A. C. True, of the Office of Experiment Stations, has been appointed to represent the Department at the general assembly of the International Institute of Agriculture at Rome, which convened early in May. He will also attend the agricultural congresses at Ghent in June.

E. W. Morse, who has been in charge of the sections of animal production and dairying of *Experiment Station Record* since 1908, has been transferred to the Dairy Division of the Department, and has been succeeded by Hugh Webster, formerly of the extension division of the Iowa College.

Agricultural Legislation in the Philippines.—Under a law enacted by the Philippine legislature February 7, the director of agriculture is authorized to establish and maintain stations for practical agricultural instruction, and to organize and develop a system of cooperative agricultural instruction in such branches as soil selection and culture; the growing of vegetables, fruits, cereals, and other crops; the production of improved seeds and plants for distribution; and animal husbandry. The administration of these stations is to rest with the director of agriculture, and with the approval of the secretary of public instruction he may appoint superintendents and all other employees, obtain lands, buildings, etc., and in general supervise the work of the stations. If deemed desirable, stations may be established by the bureau of agriculture in cooperation with any province, municipality, or agricultural associations of the islands. The act becomes effective July 1, and carries an appropriation of 150,000 pesos ($75,000).

Another law appropriates 400,000 pesos for the establishment and maintenance of colonies and plantations on the public lands for the cultivation of rice and other cereals. This fund and its administration are under the control of the governor-general. Laborers desiring to avail themselves of the benefits of the act are to be located upon homesteads suitable for the purpose as soon as possible, and title to the lands will be given in 5 years from the date of the filing of the application.

Twenty additional scholarships in the Forest School at Los Banos, Laguna, have been established, apportioned among the various provinces and awarded on a competitive basis. Holders of these scholarships are to be employed by the Bureau of Forestry for a period equal to that occupied by the courses of instruction.

Department of Superintendence of the National Education Association.—Vocational education held a prominent position at the meeting of the department of

superintendence of the National Education Association in Philadelphia, February 26–28, and its merits as compared with those of the strictly academic courses were the subject of earnest discussion.

The prosperity of the United States as a nation and the welfare of her workers are the stakes in the battle for the establishment of vocational education in the public schools of the country, according to C. A. Prosser, secretary of the National Society for the Promotion of Industrial Education, who delivered an address before the committee on agricultural education. "The conquering nation of the future will be the one able to put the greatest amount of brains and skill in what it produces," he declared. "Our interstate and foreign trade are today being threatened by the commercial prestige of Germany, which boasts that within ten years not an untrained man will be a subject of its Empire."

At another meeting of the committee, The Next Step in the Boys' and Girls' Club Movement was presented from three points of view: (1) The farmers' institute, by John Hamilton; (2) the elementary schools, by C. H. Lane; (3) the farm management investigations, by O. H. Benson. In summarizing the next step in the boys' and girls' club movement from the school standpoint the following points were brought out: (1) The school district should be made the geographical unit of the club; (2) the rural school club should be rendered as permanent, by state appropriations, as any other work found in the rural school curriculum; (3) it should aid in unifying the efforts of the local teacher, of the county superintendent, of the state department of education, and the state agricultural college, along the line of a better system of agriculture and a better citizenship; (4) it should be thoroughly correlated with the other subjects of the course of study and thereby make those subjects of more vital significance to the child; and (5) in taking the two steps as briefly outlined above, progress will to some extent have been made in uniting a portion of the boys and girls of the rural schools in a line of effort which can be made national in scope and at the same time provide for local adaptation.

At one of the sessions of the School Garden Association of America its president, Van Evrie Kilpatrick, declared that "the school garden has come to provide the material for the outdoor education. School gardening is not pushing its way into the schools merely because it is good but because it is fundamental. It is idle to say that there is not room for school gardens in our large cities. Room must be found or the child will be robbed of the major part of his natural inheritance."

International Congress for Combating Deterioration and Adulteration in Foodstuffs.—This congress is to be held at Ghent, August 1–3, in connection with a national exhibition along the same lines. The congress will be organized into sections of chemistry, hygiene, consumers and education, and legislation. Dr. A. J. J. Vandevelde, director of the Laboratory of Chemistry and Bacteriology of Ghent, and Antony Neuckens, secretary of the exhibition, Hôtel de Ville, Brussels, are general secretaries of the congress.

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EXPERIMENT STATION RECORD.

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It seems surprising that a factor upon which farming so largely depends, namely, the influence of weather and climate, should have been the subject of so little scientific investigation as regards the direct bearing of meteorological conditions upon plant and animal life. The broad field of meteorological research which has to do with the adjustment of plants and animals to their atmospheric environment, and which may be designated agricultural meteorology, has been strangely neglected by scientific investigators.

The farmer's business is such that he must of necessity take account of the weather, making him in a way a student of meteorology, and has possessed him of a fund of knowledge out of his long experience which is not expressed in figures or records, but is interpreted in the intelligence with which he adjusts his practice to the normal sequence of weather. This knowledge is unformulated and is greatly influenced by the personal equation; its profitable employment requires the application to it of the scientific method. But in this direction we have not gone very far beyond the making of elaborate records. For the most part these records have been made without any particular reference to the local condition of crops, or any attempt to correlate them agriculturally or interpret them on the basis of the influence or bearing of the various meteorological elements.

Indeed, it has recently been stated by an eminent authority on meteorology[a] that we do not yet know, as far as the weather is concerned, what constitutes a good year for agriculture. This is an admission of a lack of knowledge which could in part at least have been readily obtained, for almost every country has elaborate and extensive weather records as well as records of crop production. The separate elements of a good year have, however, not been determined, and indeed there are insufficient data upon the requirements of crops as regards these individual elements—the amounts which are advantageous and the point where an excess becomes detrimental—to judge of the relative merits of a season from the weather records.

If it is often true that the farming or cropping plan can not be changed in accordance with the weather, as it involves established

[a] W. N. Shaw. Jour. Scot. Met. Soc., 3. ser., 16 (1912), No. 29, p. 18.

rotations or a system not readily varied, it is equally true that a more definite knowledge of the meteorological elements and their influence would contribute to the intelligence and understanding of the farmer and make him more resourceful in adapting himself to conditions.

There are many indications, however, that this great field of inquiry is beginning to receive attention commensurate with its importance. Meteorologists are awakening to the necessity of (1) extending the usefulness of the existing weather services more directly to the farmer, to the end that preventable losses due to unfavorable weather conditions may be reduced, and (2) of organizing new lines of research bearing directly upon the selection and adaptation of crops and the working out of systems of cropping which will utilize to the best advantage the prevailing conditions of temperature, moisture, and the like, and involving the closest cooperation of the meteorologist, the biologist, and the farmer.

Several of the established weather services of the world are now actively engaged in the study of ways and means of securing the additional meteorological information required by agriculture, and of making that already in hand more immediately available. In a few cases separate services for agricultural meteorology have been organized.

An elaborate report, proposing an international organization of agricultural meteorology, presented at the General Assembly of the International Institute of Agriculture at Rome in the spring of 1911, was a striking evidence of an awakening to the need of development in this neglected field of agricultural inquiry. The report was by the French delegate, Louis Dop, and the review it gave of the present activities in agricultural meteorology in different countries showed how inadequate such work is as compared with its needs and possibilities.

The plan outlined in this report gives prominence to observations and experimental studies on the reciprocal relations and influences of meteorological conditions and plant growth. The recommendations of the report were approved by the Institute and referred to the International Meteorological Committee, with the request that a definite plan of international organization be prepared. The chairman of that committee, W. N. Shaw, chief of the British Weather Service, named a subcommittee of five representative meteorologists to consider and report upon a plan of uniform organization of agricultural meteorology in different countries. This subcommittee met at Paris in September, 1912, and agreed upon a number of recommendations, to be presented at this year's meetings of the International Meteorological Committee and the General Assembly of the International Institute of Agriculture at Rome. It is reported that

at the meeting of the International Meteorological Committee recently held (in April) a permanent commission to work out a plan of organization of agricultural meteorology was appointed, consisting of A. Angot, director of the French weather bureau, president; R. Börnstein, professor of physics in the Berlin Agricultural High School; P. Brounov, chief of the bureau of meteorology in the ministry of agriculture, Russia; L. Dop, French delegate to the International Institute of Agriculture; H. Hergesell, director of the meteorological bureau of Alsace-Lorraine; L. Palazzo, director of the Italian weather service; and R. F. Stupart, chief of the Canadian weather service. It is understood that these have power to appoint additional members of the commission. The action of this commission is awaited with interest in view of the bearing which the subject has upon agricultural research. The inauguration of a carefully prepared plan for this purpose would undoubtedly be far-reaching in its effects upon agricultural research and practice, and it is felt that the time for such studies is now ripe.

M. Dop's proposal is in line with action taken in France looking toward the development of agricultural meteorology in that country, in accordance with a resolution of the Chamber of Deputies passed December 22, 1910. A commission of sixty-four members, including many distinguished meteorologists, agronomists, and other scientists, presided over by J. Violle, of the Institute of France, was chosen by the Ministry of Agriculture to prepare a plan for such work. The plan proposed by this commission includes (1) a central committee of direction and technical service, organized as a section of agricultural meteorology; (2) regional stations for agricultural meteorology, attached where possible to scientific institutions and acting as centers for the distribution of forecasts and other meteorological information of regional importance, as well as for the collection of data which may be of importance to the central office; (3) warning stations, also connected where possible with local agricultural institutions, which in addition to issuing local forecasts are to give particular attention to study of the effect of varying climatic factors on the development of plants and their parasites; and (4) a special provision for the rapid collection of the information needed in these investigations by the local warning stations. It thus appears that France is preparing to follow the example of Russia in organizing a special meteorological service for the benefit of agriculture, although with less prominence given to special investigation in this field.

The service in Russia was organized in 1897. Its characteristic feature is a system of agricultural-meteorological stations scattered throughout the Empire, which, in addition to being equipped with the necessary meteorological instruments, are provided with experi-

mental fields on which various crops are grown for the purpose of definitely studying the effect of the meteorological and climatological conditions on plant growth. This system of stations, which is now organized as a separate bureau of agricultural meteorology, has accumulated a large amount of valuable data bearing upon the relation of meteorological factors to the soil and to the life and growth of cultivated plants, especially with reference to critical periods of the growth of various plants. Those experimented with have included, among others, corn, wheat, oats, rye, millet, and buckwheat. Similar studies have been extended to the effect of the meteorological factors on the life and activities of domestic animals.

The soils of Russia have been classified on a climatological basis, and popular information about the weather and weather forecasting in relation to crop production has been widely distributed among farmers. This Russian Bureau of Agricultural Meteorology therefore gives great prominence to problems of research and the direct correlation of meteorological factors and plant growth, without neglecting the popular and educational features of the work. It is probably the most completely organized attempt at exact and comprehensive investigation in this field now in existence.

A leading feature of the last meeting of the British Association for the Advancement of Science was a discussion of the application of meteorological information to agricultural practice, and at the recent meeting of the Association of American Agricultural Colleges and Experiment Stations at Atlanta there was a conference of Weather Bureau men regarding steps to be taken to promote closer relations between the U. S. Weather Bureau and the agricultural colleges and experiment stations in studies in agricultural meteorology.

Notwithstanding these and other promising evidences of progress in agricultural meteorology which might be cited, and the generally admitted possibilities and importance of the subject, actual studies of the relation of climatic factors to conditions of plant production have not kept pace with other lines of agricultural investigation.

The need for careful studies of the influence of meteorological and climatic conditions on the growth of plants has often been urged, and numerous suggestions for work along this line have been offered from time to time. It was recognized in the Hatch Act, which includes meteorology among the important subjects enumerated for investigation by the stations. In 1892 this Office issued a bulletin (No. 10) prepared by Prof. M. W. Harrington, then Chief of the U. S. Weather Bureau, dealing with lines of meteorological work in which it was thought the experiment stations might profitably engage. The hope was then expressed that the stations would be

able to give more general and serious attention to this subject, thus raising the grade of their meteorological work and bringing it into direct relation to their other researches in the sciences on which agriculture depends.

Among the lines of work proposed in this bulletin as especially suited for the experiment stations, and which it was maintained "afford a field for the display of skill and talent which is not surpassed in any other branch of science," were "such problems as the distribution of temperatures within such heights in the air and depths in the soil as are occupied by animal and plant life and the changes of temperature with the hour of day, with the season, with the weather, and with the topography; the problems of air drainage; the occurrence of frosts and protection from them; the distribution of moisture; the problems of condensation and evaporation of water in the air; the solar and terrestrial radiations and the disposition of them; the action of the meteorologic elements on organic life and the reactions of life on them; the actions and reactions of weather, climate, and soil; the precipitation of the moisture of the air and the disposition of it."

In further development of this idea, Prof. Cleveland Abbe has advocated the more exact study of the relation of meteorological and climatological conditions to plant growth by means of "climatological laboratories" in which the conditions are more or less completely controlled, thus supplementing and furnishing a check upon out-door observations.

In 1897 this Office outlined a systematic plan of field observations, to be duplicated in a number of localities with varying climatic conditions, which was designed to give definite information regarding the relation of some of the more important meteorological factors to the growth of corn.[a] This crop was selected on account of its wide distribution and adaptability and its great economic importance, but the plan was applicable to other plants as well. No systematic work of the kind proposed was carried out in this country, but it is interesting to observe that the plan adopted by the Russian service about the same time embodies the essential features of the plan proposed by the Office.

There is evidence that those who give thought to this subject are more clearly convinced than ever before of the need of experimental investigation into the specific effects of known and controlled conditions of moisture, temperature, sunshine, etc., on plant growth and healthy development. A distinguished meteorologist, Professor Schuster, in an address before the British Association for the Advancement of Science, "warned meteorologists against becoming the slaves of routine and continuity, and deprecated the continued

[a] E. S. R., 9, p. 501.

accumulation of observations unless they were undertaken with a view to elucidate particular problems. He even went so far as to suggest that it might be desirable to stop all observations for five years, in order that the energy of every observer and computer might be concentrated on the discussion of the results already obtained, and the preparation of an improved scheme of observation for the future."

That meteorological data already accumulated may be used to great advantage in the elucidation of certain classes of problems in agricultural meteorology is shown by the work of Shaw and Hooker on rainfall and wheat yields in England. More recently Voorhees, of the U. S. Weather Bureau and the Tennessee Station, has pointed out in an interesting way the relation of meteorological conditions to the choice, location and time of planting of crops; to the arrangement of cropping systems to utilize the meteorological elements of a region to the fullest extent practicable; and to the eradication of the cattle tick. Mr. Voorhees has also called attention to the need of quite extensive and systematic cooperative work bearing on these matters, which awaits only adequate plan and leadership in inaugurating it.[a]

Such special inquiries are of undoubted value. But beyond this there is a present need for more systematic research on a plan similar to that of the Russian Bureau of Agricultural Meteorology, and embodying certain of the features proposed by Professor Abbe and this Office. In such studies the meteorological factors would be known or more or less controlled, and would be studied in direct connection with the growing plant. They might thus be used with certainty in interpreting the phenomena of plant life, and in elucidating important features of a wide range of fundamental problems of plant (and animal) physiology, which are now pressing for solution by the agricultural experiment stations.

In this field of inquiry the opportunities are almost boundless. Weather and climate are among the most important and influential elements in the environment of the plant or crop. Without a knowledge of the extent and character of these influences the physiological conditions of health and disease and the reason for many phenomena commonly observed in the adaptation of cultivated plants can not be explained. Furthermore, the interpretation of findings under experimental conditions must remain uncertain, and the introduction of new crops or varieties will depend on a process of "cut and try."

There is a whole range of problems in the life of the crop and the method of its growth upon which much light would be shed by exact

[a] Proc. Soc. Prom. Agr. Sci., 1912, p. 87.

observations and experiments as to the influence of the amount and distribution of humidity, temperature, sunshine, wind, and other atmospheric conditions. The measure of these influences in different degrees of intensity and at different stages of growth on vigor and health, the tolerance of the plant toward unfavorable conditions, and its ability to adapt itself or to be adapted to varying conditions, lead directly into the realm of plant physiology and agronomy. And correlated with these superficial influences is the climatic condition within the soil, which often determines the extension of crops and of profitable agriculture. No line of study would be more practical in its ultimate application, and it would furnish a fundamental basis in science where such is now largely lacking.

The investigations in plant production have led up logically to studies of these environmental elements, and the special qualities of varieties or strains to thrive under or endure exceptional conditions. These are now being entered upon to some extent from the physiological side. The work of Montgomery and Kiesselbach at the Nebraska Station with corn, and of Burns in Vermont on forest seedlings, are interesting examples of such studies, as are also the investigations at the Tennessee Station already referred to.

The nature of the subject calls for the biological as well as the meteorological outlook. This has been a weak point heretofore. Such study requires a combination of interest and qualities, either in a single observer or an association of effort, which has been rare in the past. Without this, meteorological studies at the experiment stations rarely result in much more than an accumulation of weather data. The biological considerations give life and point to such data, which otherwise remain a dry record. Until meteorological observations are taken and studied with reference to the life of plants they will continue to have but little bearing on the progress of agricultural science, and their accumulation by an institution for agricultural experimentation and research will be of quite limited value.

From the foregoing it appears in brief that the fundamental needs as regards the application of meteorology to agriculture are in logical sequence and ascending order of importance as follows: (1) The organization and correlation of statistical data on weather conditions and crop growth already available in large amount; (2) the organization, as proposed by Voorhees, of more extensive and systematic effort to secure exact data along this line by all interested agencies; and (3) special studies of the adjustment of plants and animals to their atmospheric environment, requiring the cooperation of the biologist with the meteorologist.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Study in regard to the acidity of soils, A. GREGOIRE (*Bul. Soc. Chim. Belg., 26 (1912), Nos. 6, pp. 336–342; 7, pp. 362–375; 8–9, pp. 386–409, fig. 1; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 19, p. 940; Analyst, 37 (1912), No. 438, pp. 422, 423; 37 (1912), No. 439, pp. 466–468, fig. 1*).—After pointing out that the estimation of the acidity of soils is necessary for determining the lime requirements and that if acids are present they can not be easily extracted by present-day methods, the author proposes a method for determining the acidity, which is based on the liberation of iodin from a mixture containing an iodid and iodate. The procedure was first suggested by Kjeldahl for the estimation of feeble organic acids.

"The reagent employed contains 55.3 gm. of potassium iodid, 14.3 gm. of potassium iodate, and 99.2 gm. of crystallized sodium thiosulphate per liter. The solution of iodin employed for titrating back the excess of thiosulphate contains 17 gm. of iodin and 25 gm. of potassium iodid per liter, and the solutions are standardized against each other by adding 20 cc. of fifth-normal acid to the first, and titrating back with the iodin. . . . For the estimation, 10 gm. of soil, passed through a sieve with holes of 1 mm., is placed in a stoppered flask with 15 cc. of the Kjeldahl reagent. After a sufficient time, the volume is made up to 105 cc., the solution is filtered, and 100 cc. is drawn off for titrating back the thiosulphate. If the soil be digested with the diluted Kjeldahl solution, the action is very much weaker than with the undiluted reagent. The action of the reagent upon the soil is not instantaneous, but iodin continues to be liberated for a very considerable time, so that it seems difficult to arrive at a final point."

The results obtained with the same soil, however, were very regular, and according to the author it is desirable to neglect the slow ulterior reaction of the reagent and to confine the observations to the iodin liberated by the more pronounced organic acids in a period of 24 hours. The temperature of digestion within certain limits has no effect on the results.

"Further tests have also shown that a large number of inorganic substances behave as acids toward the Kjeldahl reagent; for instance, aluminum sulphate and chlorid react with the whole of their acid, and in the case of ferrous ammonium sulphate about half of the sulphuric acid reacts, corresponding to that which is in combination with iron." Even those soils which were alkaline to litmus and contained notable quantities of calcium carbonate showed some acidity with the Kjeldahl reagent. Accordingly it is necessary to establish some limiting standard. Probably the most of the acidity in soils is due to organic matter, and while the total acidity may have little absolute significance the ratio of the Kjeldahl acidity to organic carbon will give valuable data in regard to whether a soil is of a normal or abnormal make-up.

"In view of this close correlation between the acidity and the organic matter, the author has worked out a method for the estimation of the organic carbon

by combustion of the soil previously treated with acid to decompose the carbonates. The combustion tube is of quartz, from 20 to 22 mm. in diameter and 700 to 800 mm. long, connected with the usual supply of oxygen at one end and charged with a layer of about 100 mm. of copper oxid; about 5 gm. of soil is weighed out in 1 or 2 quartz boats. The arrangement for absorbing the carbon dioxid produced consists of a Pettenkofer tube, from 18 to 20 mm. in diameter and 1.5 to 1.8 meters long. It has an inclination of 120 mm. per meter and is provided with 3 or 4 baffle cones of platinum to prevent the direct passage of the bubbles of gas. The absorption liquid is a solution of barium hydroxid. When the combustion is finished the further end of the absorption tube is attached to a filter tube containing a plug of asbestos, similar to but larger than those employed for collecting the cuprous oxid in the estimation of reducing sugars. The absorption tube is then detached from the furnace and placed in a vertical position. The filtration of the barium carbonate takes place fairly rapidly and the tube is rinsed down with boiled water. The barium carbonate in the filter tube is estimated gasometrically. Scheibler's apparatus is unsuitable because it has been found that the caoutchouc bag absorbs carbon dioxid. The carbon dioxid must therefore be generated in a glass vessel and measured by displacement of air, air only coming in contact with the rubber connections. The gas evolution vessel employed is shown in an accompanying sketch; it is a cylinder 45 mm. in diameter and 350 mm. long, surmounted by a stopcock and bulb which is charged with acid, while the lower end is ground for insertion either into the neck of a flask or into the filter tube containing the barium carbonate. This vessel is adapted to lie in a large trough of water, while the upper end is connected by a rubber tube with the gas measuring apparatus. Nitric acid of 1.2 specific gravity is employed, since with hydrochloric acid the barium chlorid is only sparingly soluble. A correction must be made for the solubility of the carbon dioxid in the acid liquid."

The use of a fixed correction is, however, inaccurate, because the solubility of the gas depends upon its partial pressure, and therefore the correction varies with the relative quantity of gas evolved and the air present. "It is necessary, after evolution of the gas is complete, to close the stopcock and effect a thoroughly uniform mixture of the carbon dioxid and air remaining in the cylinder; the cock is then opened again, the levels readjusted, and the reading taken. The correction for solubility is then found by means of the formula $\frac{S \times V \times H}{A \times 760}$, where S = the coefficient of solubility of pure carbon dioxid, V = the volume of carbon dioxid read off, H = the atmospheric pressure reduced to 0° C., and A = the volume of the evolution vessel, up to the stopcock, minus the volume of the acid. The coefficients of solubility of pure carbon dioxid in 10 cc. of nitric acid of 1.2 specific gravity are given as follows, in terms of gas at 0° C. and 760 mm. pressure: At 10°, 11.48 cc.; 12°, 11.28 cc.; 14°, 11.02 cc.; 16°, 10.67 cc.; 18°, 10.28 cc.; 20°, 9.78 cc.; 22°, 9.25 cc.; 24°, 8.56 cc. In the case of hydrochloric acid the coefficient of solubility may be taken as the same as in the case of water."

Potash analysis, E. A. Mitscherlich and H. Fischer (*Landw. Vers. Stat., 78 (1912), No. 1–2, pp. 75–86*).—Although the composition of potassium-sodium cobalti nitrite is not constant, but varies with the concentration of the reagent used, it is deemed justifiable to use an excess of precipitating reagent (1 part of potassium to from 30 to 3,000 parts of sodium) in the method, because the reduction factor changes only within the limits of error of the potassium determination. For calculating the potassium (K_2O) from the number of cubic centimeters of fiftieth-normal potassium permanganate used, the figure 0.000161

is to be employed. The factor mentioned in previous work (E. S. R., 27, p. 109), i. e., 0.000157, is considered incorrect.

This method can also be employed as a rapid means of determining the amount of potassium present in potassium sulphate and kainit.

The simple carbohydrates and the glucosids, E. F. ARMSTRONG (*London, New York, and Bombay, 1912, 2. ed., pp. VIII+171*).—This is the second revised edition of this work (E. S. R., 23, p. 305).

On a new glucolytic ferment of yeast, V. BIRCKNER (*Jour. Amer. Chem. Soc., 34 (1912), No. 9, pp. 1213–1229*).—This is a description of a new enzym which has been noted in the yeast employed for preparing California steam beer, and which has the property of accelerating the decomposition of glucose at an elevated temperature.

"This new ferment is not identical with zymase. It is very active at a temperature of 70°. It causes no gas formation and yields no alcohol. Its action on glucose at 70° manifests itself by a rapid darkening of the mixture, a strongly acid reaction, a gradual formation of a carbonlike, solid deposit, and the development of an odor similar to that of caramel. The ferment may be extracted from a yeast powder (Dauerhefe) which is best obtained by treating the cells with ethyl alcohol. From the watery extract the yeast glucase may be obtained and purified by repeated precipitation with alcohol; but this process always involves a weakening of the ferment. Yeast glucase is very stable in aqueous solution if kept at room temperature under sterile conditions. Boiling does not destroy its activity. Yeast glucase shows activity in neutral or acid solution against glucose, polyphenols, and lactates. The preparation does not contain tyrosinase, nor does it act as a peroxidase against glucose.

"The ferment solution gives a strong pyrrol reaction (Neuberg). Yeast glucase shows some relationship to the oxidases, but with regard to its main function it is to be classed together with zymase in a group which stands separately from oxidases and the hydrolytic ferments, and to which Euler has applied the term 'Gärungsenzyme.' The transformation products of glucose resulting from the action of this ferment are largely acids, none of which has so far been definitely identified. However, among the cleavage products of the sugar the presence of pentose and of formaldehyde could be ascertained."

Enzyms present in alfalfa seeds.—Alfalfa investigation, IV, C. A. JACOBSON (*Jour. Amer. Chem. Soc., 34 (1912), No. 12, pp. 1730–1740*).—Continuing previous work (E. S. R., 28, p. 110), it was found that alfalfa seeds contain enzyms which have the power "of hydrolyzing starch and amygdalin, like amylase and emulsin, respectively; an enzym that coagulates milk, like rennin; an enzym that precipitates purpurogallin from a pyrogallol solution with hydrogen peroxid, like the ordinary peroxidases; and an enzym that has the power of digesting casein and Witte peptone, like a protease.

"The investigation further established that this protease is a vegetable erepsin, for it will not begin the digestion of egg albumin, serum, legumin, or conglutin; and that its digestion of casein and Witte peptone is inhibited to some extent by the presence of small quantities of egg albumin and serum.

"The seeds, in all probability, do not contain invertase, and if a lipase is present it is not soluble in water. It is not probable that the acidity developed in the seed extract, when allowed to stand, is due to a lipase, for the clear extract, having no solid present, also turns acid in the given time, and this extract is unable to hydrolyze ethyl butyrate.

"[The author intends to] carry out similar experiments with extracts from the roots, stems, and leaves of the alfalfa plant."

The formation of *d*-lactic acid in the incubated fowl egg, K. ANNO (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 2–3, pp. 237–240; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 22–23, p. 883*).—In all probability lactic acid is constantly present in the fresh egg. After incubating for 3 days there is produced in the white of the egg a large amount of lactic acid, whereas in the yolk under the same condition only a slight increase in the acidity is noted.

Estimation of crude fiber, E. GURY (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 3 (1912), No. 3, pp. 99–105; abs. in Chem. Zentbl., 1912, II, No. 7, pp. 556, 557; Analyst, 37 (1912), No. 439, p. 447*).—This is a study of König's method, Parry's modification[a] of Henneberg's method, Filsinger's method, and a modification of the Zeisel-Stritar method, which is described below. It consists "in treating the finely divided, fat-free substance (1 to 1.5 gm.) with 200 cc. of water and 10 cc. of concentrated lactic acid, the whole being boiled under a reflux condenser for 30 minutes. The function of the lactic acid is to render the material more open to the attack of the reagents used subsequently; it also shortens the time required for filtration. The insoluble matter is filtered off on an ordinary filter paper, washed, and returned to the flask with 180 cc. of water and 20 cc. of nitric acid, and, after digesting for 30 minutes, is submitted to the process of Zeisel and Stritar.

"König's method, as well as that of Parry, leads to the hydrolysis of from 13 to 16 per cent of the cellulose in filter paper, whereas the method of Zeisel and Stritar does not attack cellulose. Yet the methods of König and Parry frequently discover more than 50 per cent more crude fiber in cocoa or cacao shell than is found by the author's modification of Zeisel and Stritar's method. This is due to the fact that, even with very fine division of the sample, the interior portions of the larger particles escape the action of the reagents, unless opened to this action in some such way as that now suggested. Even when using his lactic-acid method, the author subjects cocoa and cacao shell to special methods to secure fine division of the sample. The paper includes a description of a small winnowing machine of simple construction. By means of this machine the finer particles of a small sample are driven forward, and the heavier residue is repeatedly ground and returned to the machine until all is fine enough.

"In view of the small difference in crude fiber content of cacao mass (5.5 to 8 per cent) and cacao shell (11 to 18 per cent), the author thinks that an adverse judgment on the cacao should never be based on the percentage of crude fiber alone. On the other hand, he thinks the Swiss Lebensmittelbuch is unduly lenient in fixing 11 per cent as the permissible limit of crude fiber in cacao. Though König's method may show nearly 9 per cent of crude fiber in some genuine samples, the author's process never discovers as much as 8 per cent. Filsinger's method is much too crude to give results of any value in examining cacao for shell."

Clerget sugar as determined in normal beet-sugar molasses by a neutral double polarization, E. SAILLARD (*Abs. in Chem. News, 106 (1912), No. 2762, pp. 219, 220*).—It was found that the usual salts present in molasses diminish the dextro rotation much more than the levo rotation of the invert sugar produced from the saccharose. Hydrochloric acid increases the left-hand rotation of the invert sugar while sulphurous acid has no effect thereon. The usual salts in molasses have a tendency to cause the nitrogenous substances which are present to rotate the plane of light from left to right.

"Salts vary in power in this respect. If one added hydrochloric acid to the nitrogenous matter and salts the rotation to right becomes about equal. In equivalent quantities hydrochloric acid increases the right rotation of asparagin

[a] Chem. and Drug., 79 (1912), No. 5, pp. 167, 168.

and glutamic acid more than sulphurous acid does. Hydrochloric acid in direct polarization of pure sugar always diminishes the observation, the same if it is mixed with urea and observed in 2 or 3 minutes. Sulphurous acid does not cause inversion of sugar at 20° during the time necessary for polarization, but one can not say how much sulphurous acid will produce the same deviation to the right as the hydrochloric acid used for inversion. This quantity varies in molasses, especially if they contain different quantities of invert sugar. Sulphurous acid has no effect on the rotatory power of invert sugar.

"Clerget's method of 1852 for removing the influence of nitrogenous materials, by adding to the direct polarization two-sevenths of the difference between the polarization to the left of the neutral inverted solution and of the acid inverted solution can not be recommended. One may determine the Clerget of normal beet molasses either by Andrlik's urea method at 20° C., or Ogilvie's by invertase, or by the method of double neutral polarization with the use of NaCl or KCl for the direct polarization (Saillard). These observations do not apply to molasses containing much raffinose.

"The French Clerget method, like the Clerget-Herzfeld method, gives too low a sucrose, especially in presence of much nitrogenous material."

The use of sulphurous acid in making the acid direct reading in the double polarization method of determining sucrose, J. P. OGILVIE (*Internat. Sugar Jour., 14 (1912), No. 167, pp. 624–630*).—The author points out that the results submitted by other authors (see above) were obtained with sulphurous acid solution, whereas in his own work (E. S. R., 27, p. 508) sulphurous acid gas was employed, and this leads to the formation of larger crystals which can be filtered off without difficulty. He has conducted some additional experiments, using as before the new Pellet sulphurous acid direct reading and operating upon samples of beet molasses from Dutch, German, and British sources.

It is concluded from the experiments that, as far as beet molasses is concerned, "the difficult problem of making the acid direct reading in the double polarization method is solved by the use of sulphurous acid. This reagent gives direct readings that are identical with those obtained by hydrochloric acid; the reading remains constant for a sufficient long time; and, moreover, the liquid is very appreciably decolorized.

"In operating the double polarization method of determining sucrose in beet molasses involving the use of the sulphurous acid direct polarization, the procedure recommended is as follows: 200 cc. of a normal sugar weight solution of the molasses, defecated with a slight excess of basic lead acetate, is prepared.

"For the direct reading, 50 cc. of this defecated normal sugar weight solution is transferred to a 100 cc. flask, saturated with sulphur dioxid from a syphon for 10 minutes, the flask being immersed in cool water to prevent any rise in temperature, and made up to volume with water at standard temperature. Instead of saturating the assay liquid with sulphur dioxid, it may be made up to 100 cc. with a freshly prepared concentrated solution of sulphurous acid (containing about 7.5 gm. of sulphur dioxid per 100 cc. at 20° C.). After mixing, the liquid may be treated with a suitable decolorizing carbon if necessary; it is then filtered, using a close paper, and returning the filtrate until the runnings are clear, which is generally almost instantly, and polarized at 20° in the 200 mm. water-jacketed tube.

"For the inversion reading, 50 cc. of the same defecated normal sugar weight solution of the molasses is transferred to a 100 cc. flask, 25 cc. of water, and 5 cc. of hydrochloric acid (1.188 specific gravity) added, and the liquid inverted according to the well-known Herzfeld procedure, cooled, made up to

bulk, mixed, treated with decolorizing carbon, if necessary, and read in the same 200 mm. water-jacketed tube at 20°. Finally the percentage of sucrose is calculated from the two readings from the Herzfeld formula as usual, applying the constant from the Herzfeld table appropriate to the concentration."

Study of the different methods for determining sucrose in cane molasses: Complete analysis of a cane molasses, C. FRIBOURG (*Internat. Sugar Jour., 14 (1912), No. 168, pp. 702–712*).—This is a study of the different processes for determining the sucrose in beet and cane molasses. The molasses tested came from a refinery in Brazil.

Determination of oxalic acid in vegetable products, A. GRÉGOIRE and E. CARPIAUX (*Bul. Soc. Chim. Belg., 26 (1912), No. 10, pp. 431–434*).—After reviewing the methods proposed for determining oxalic acid, the authors describe a method suitable for determining oxalic acid in sesame cake, a substance rich in phosphorus, calcium, and proteins.

The method consists in digesting 5 gm. of the powdered cake, preferably extracted with ether, in 20 cc. of 4 per cent hydrochloric acid on a water bath for 1 hour. To the mixture is added a small quantity of dry sodium sulphate and about 100 cc. of 94 per cent alcohol. The precipitate is collected on a filter and washed with alcohol. A slight excess of ammonium hydroxid is added to the filtrate, the alcohol removed, acidified with dilute hydrochloric acid, and filtered. The oxalic acid is precipitated from the filtrate, which has been previously rendered slightly acid with acetic acid, with calcium acetate, collected on a filter, washed, dissolved in hydrochloric acid, evaporated to dryness, and a few drops of 25 per cent hydrochloric acid and a small quantity of sodium sulphate added. The resulting dry mass is then extracted with ether 5 or 6 times, the ethereal solution rendered slightly ammoniacal, evaporated to dryness, and the residue extracted with water. The remainder of the process is the usual one.

Estimation of oxalic acid in the needles of Coniferæ, J. OTTO (*Ztschr. Analyt. Chem., 51 (1912), No. 5, pp. 296–300; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 595, II, p. 500*).—The method is as follows:

"Three to 4 gm. of the dried and powdered sample is heated with 150 cc. of 1 per cent hydrochloric acid for ½ hour on the boiling water bath. The filtrate and washings are evaporated to 200 cc. to coagulate some organic colloids. After acidifying with twice-normal acetic acid, the solution is precipitated at the boiling heat with an excess of a 10 per cent solution of calcium acetate. The calcium oxalate is collected, washed, and burnt to ash. In order to free the precipitate from traces of iron and manganese, the ash is dissolved in hydrochloric acid, and after adding ammonia a little bromin vapor is passed. The filtrate is then heated to boiling and the calcium again precipitated with excess of ammonium oxalate. After washing, the precipitate is dissolved in dilute sulphuric acid, heated to 40°, and the oxalic acid is titrated with permanganate."

A table is given showing the amount of oxalic acid contained in pine needles obtained from various sources. The amount of oxalic acid increases with the age of the plant.

Identification of tanned skins, C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Circ. 110, pp. 2, pls. 9*).—Photographs made from wax impressions of leather in transmitted light under a magnification of 3¼ diameters are shown to be a great convenience in making comparisons of grains of leathers. This obviates the difficulty often experienced of having to carry in mind a true impression of the grain of leather for comparison with that of the genuine leather, and also eliminates the loss of detail experienced in making photographs directly of the leather. Nine plates are shown to illustrate the above points.

The extraction and use of kukui oil, E. V. WILCOX and ALICE R. THOMPSON (*Hawaii Sta. Press Bul. 39, pp. 8*).—This deals with the commercial importance and chemistry of kukui oil, a drying oil which is expressed from the nuts of the kukui tree inhabiting Polynesia, Malaysia, Philippines, Society Islands, India, Java, Australia, Ceylon, Bengal, Assam, China, Tahiti, and Hawaii, and known in different countries as kukui oil, country walnut oil, kekune oil, artists' oil, Bankul oil, Eboe oil, candle nut oil, Spanish walnut oil, Belgaum oil, etc. This oil is used for a variety of purposes, being suitable for the manufacture of soft soap, in the preparation of oil-varnishes, paints, and linoleum, for burning, as a medicine, and similar purposes.

Estimates of various individuals personally familiar with forest conditions in Hawaii placed the total area of kukui at from 10,000 to 40,000 acres. With 15,000 acres, 80 trees per acre, and 200 lbs. of nuts per tree, there would be a yield of 8 tons of nuts per acre. Experiments indicated that one person could easily pick up 500 lbs. of nuts per day free from the soft outside husk. Only an extremely small percentage of the nuts spoil or turn rancid even after lying 2 years on the ground.

Experiments made in the laboratory indicated that it would require 210 tons of nuts to produce 10,000 gal. of oil weighing 7.36 lbs. per gallon.

The oil when extracted from the crushed kernel with ether or petroleum is of a light yellow color, but if expressed it may be dark colored because of impurities. A sample of oil extracted with gasoline gave the following constants: Specific gravity, 0.92 at 15.5° C.; saponification value, 179.1; iodin number, 155.5; Hehner value, 89.9; soluble acids, 1.71; and Reichert-Meissl number, 2.82. The fatty acids congealed to a pasty mass between 18 and 20°. The oil itself was still fluid at −3°. The drying property of the oil is indicated by the high iodin value.

A sample of the expressed oil in a crude state, containing suspended matter and having a dark red color, had the following values: Specific gravity, 0.92 at 15.5°; saponification value, 190.2; and iodin number, 164.2.

The constituents of the kukui kernel were as follows: (1) One-year-old nuts, moisture 3.55 per cent, protein 18.75 per cent, fat 65 per cent, fiber 2.14 per cent, nitrogen-free extract 7 per cent, and ash 3.56 per cent; (2) fresh nuts, moisture 7.14 per cent, protein 19.88 per cent, fat 66.25 per cent, fiber 1.39 per cent, nitrogen-free extract 2.29 per cent, and ash 3.05 per cent; and (3) immature nuts, moisture 13.39 per cent, and fat 56.7 per cent. Starch was apparently absent in the kernel and the amount of hydrolyzable carbohydrates was low. The press cake contained large amounts of phosphoric acid, potash, and nitrogen, which are available as fertilizers, but the cake is of no value as a fodder, although rich in protein, because it has a poisonous effect on stock.

The effect of certain pigments on linseed oil, with a note on the manganese content of raw linseed oil, E. W. BOUGHTON (*U. S. Dept. Agr., Bur. Chem. Circ. 111, pp. 7*).—Raw linseed oil, kept in glass jars away from bright sunlight for 2 years, did not change appreciably in its analytical constants with the exception of a slight rise in the acid number. Oils kept in contact with pigments for 1 to 2 years showed no reduction in their iodin value which would place them below a figure frequently given by samples of pure raw linseed oil. The greatest decrease was caused by the so-called inert pigments, kaolin and Indian red. In addition to kaolin and Indian red, the following pigments were considered: White lead (basic carbonate), flake graphite, magnetic black, zinc yellow, artificial graphite, zinc white, chrome yellow, and chromium oxid green.

"The large amount of ash from the white-lead samples undoubtedly shows that some of the pigment has been actually dissolved by the oil. The other

figures for ash, however, do not show with certainty that there has been an appreciable solution of pigment. The specific gravity of the oil was raised slightly in almost every case, but as with the iodin number the effect of 2 years' exposure was practically the same as that of 1 year. The upper limit for raw oil is placed at 0.936 at [15.5° C.[a]]. Many of the extracted oils are slightly above that figure."

Kaolin also had a greater bleaching effect on the oil, while black pigments and zinc white were inert in this respect. Sixteen samples of raw linseed oil of known purity and source were examined in regard to their ash and manganese content. The lowest amount of ash was found to be 0.02 per cent and the highest 0.21 per cent. The figures for manganese vary between a faint trace and 0.0008 per cent calculated to the oil.

Analyses of paints, E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 11, pp. 175–178*).—Analyses of the pigment and vehicle of several paints, with observations on their color, and the volume of can and paint, are reported.

Canning tomatoes at home and in club work, J. F. BREAZEALE and O. H. BENSON (*U. S. Dept. Agr., Farmers' Bul. 521, pp. 36, figs. 12*).—This publication aims to present practical methods of using canning outfits at home and out-of-doors in the canning schools organized at school centers, and it is intended primarily for girls on the farm. Among the topics discussed are canning tomatoes in glass jars by the open-kettle and closed-boiler methods, sterilization and description of the sterilizer, kinds of containers in use, uses of tomatoes, recipes for tomato catsup, Chili sauce, chowchow, tomato relish, chopped pickle, green tomato pickle, tomato sweet pickle, piccalilli, preserved tomatoes, and tomato mincemeat, portable home-canning outfits and their use, suggestions for canning tomatoes at home, some possibilities of the canning work, finding a market, and some results of the canning clubs in 1911.

Tobacco curing, W. W. GARNER (*U. S. Dept. Agr., Farmers' Bul. 523, pp. 24, figs. 4*).—This has been prepared to supplant Farmers' Bulletin 60 (E. S. R., 9, p. 748) which is out of print. It considers the ripening of tobacco, nature of the curing process, curing picked leaves compared with curing on the stalk, air curing, flue curing, and fire curing.

The alcohols obtained from maize and potatoes, G. FOTH (*Ztschr. Spiritusindus., 34 (1911), No. 47, pp. 566, 567; abs. in Bul. Assoc. Chim. Sucr. et Distill., 29 (1912), No. 7, pp. 471, 472; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 4, pp. 1026, 1027*).—In this work a comparison was made between the amount of alcohol obtained from a mixture of maize (corn) and barley, and from a mixture of potatoes and barley. The amount of steam utilized per hectoliter of alcohol produced is considered.

Association of Agricultural Experiment Stations of the German Empire (*Landw. Vers. Stat., 78 (1912), No. 1–2, pp. 1–74*).—This is a report in regard to the business transacted at the meetings held in 1911 at Karlsruhe and in 1912 at Berlin. It deals in part with the examination and judgment of sugar beets, feeding stuffs (microscopical methods), influence of inversion in the precipitation of phosphoric acid, determination of fat in feeding stuffs, and the determination of starch in feeding stuffs by Lintner's method.

METEOROLOGY—WATER.

Meteorology and agricultural meteorology, P. POSKIN (*Ann. Gembloux, 23 (1913), Nos. 1, pp. 1–18; 2, pp. 61–89, pl. 1, figs. 9*).—The development of meteorology as a science and the history and present status of the weather

[a] Proc. Amer. Soc. Test. Mat., 9 (1909), p. 164.

services of different countries are reviewed with special reference to their relation to agriculture. Attention is called to the recent organization of an agricultural meteorological service in France, to the appointment by the International Meteorological Committee of a special commission on agricultural meteorology, and to the conclusions reached by this commission regarding means of improving the present weather services from the agricultural standpoint, including simplification of apparatus for more general use, systematic observations on sunshine and the state of the sky, wider distribution of forecasts, increase of local forecasts stations, and the use of weather charts in the primary schools. The article also discusses periodicity in the weather and the relation of sun spots to periodicity, as well as the relation of solar radiation, temperature, and rainfall, the latter being based upon temperature and rainfall observations at Uccle from 1843 to 1859. A short bibliography is given.

Monthly Weather Review (*Mo. Weather Rev., 40 (1912), Nos. 11, pp. 1611–1764, pls. 10, figs. 3; 12, pp. 1765–1924, pls. 10*).—In addition to the usual climatological summaries, lake levels, weather forecasts and warnings for November, 1912, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology, a condensed climatological summary, and climatological tables and charts, these numbers contain the following special papers:

No. 11.—Note on Local Storms in Illinois on November 12, 1912, by C. J. Root; Daily Ranges of Temperature in Nevada, by H. S. Cole; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds During the Month of November, 1912, by N. R. Taylor; Notes on the Streams of the Upper San Joaquin Watershed, by W. E. Bonnett; Relation of Rainfall to Yield of Milk, by A. G. McAdie; The Rise of Temperature Associated with the Melting of Icebergs (illus.), by H. T. Barnes; Frazil and Anchor Ice Dissipated by a Simple Remedy; The Storms of November in Jamaica, West Indies; and A St. Lawrence River Mirage, by D. Manning.

No. 12.—Climatic Summary for the Year 1912 [South Atlantic and East Gulf States], by C. F. von Herrmann; Summary of the Year 1912 [the Lake Region], by H. J. Cox; Dr. Friedrich Brendel [Biographical Sketch], by M. L. Fuller; Prolonged Dry Period in Minnesota, by T. A. Blair; Dam and Electric Power Plant at Powersite, Mo., by J. S. Hazen; Notes on the Rivers of the Sacramento and Lower San Joaquin Watersheds for December, 1912, by N. R. Taylor; Notes on the Rivers of the Upper San Joaquin Watershed, by W. E. Bonnett; Ocean Temperatures on California Coast, by G. F. McEwen; Monthly and Annual Precipitation at Mazatlan, Sinaloa, Mexico, for the Years 1909, 1910, 1911, and 1912, by W. E. Alger; and Two Climatic Cross-sections of the United States, by R. DeC. Ward.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. W. Angier (*Massachusetts Sta. Met. Buls. 289, 290, pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1913. The data are briefly discussed in general notes on the weather of each month.

Weather observations, M. A. Blake, B. D. Halsted, et al. (*New Jersey Stas. Rpt. 1911, pp. 82–86, 382–385*).—Observations on temperature and precipitation during the year ended October 31, 1911, are summarized.

Report of the consulting meteorologist, J. F. Voorhees (*Tennessee Sta. Rpt. 1910, pp. 114–116, figs. 5*).—A study of temperature and rainfall conditions with reference to crop production more fully reported elsewhere (E. S. R., 26, p. 415), is here briefly summarized.

Atmospheric pollution: A standard method of measuring its amount and character, J. B. C. KERSHAW (*Surveyor, 43 (1913), No. 1104, pp. 462–464, figs. 4*).—The method used by Cohen and Ruston (E. S. R., 27, p. 212) is described and studies of the air of London and environs made with it are reported. See also a previous note (E. S. R., 27, p. 128.)

Shallow wells in Illinois, E. BARTOW (*Municipal Jour., 34 (1913), No. 15, pp. 524, 525, figs. 2*).—In this paper, by the director of the state water survey, it is stated that "the results of the examination of the water from shallow wells showed three-fourths of them to be contaminated and possibly dangerous."

The water supply of farm homesteads in Canada, F. T. SHUTT (*Abs. in Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), App.—Sects. VIa–XIb, pp. 263, 264*).—This is an abstract of a paper setting forth the very unsatisfactory character of the average water supply on Canadian farms. See also a previous note (E. S. R., 27, p. 317.)

SOIL FERTILIZERS.

Modern soil investigation and agricultural practice, P. VAGELER (*Pflanzer, 9 (1913), No. 1, pp. 3–16*).—This is a review of the present status and practical value of physical and chemical investigations of the soil. It is held that studies of the physical properties of the soil to date have been of much more practical value than chemical studies. On the whole, physical, chemical, and mineralogical determinations furnish a basis for judging the value of a soil in that they give an insight into the composition of the so-called raw material.

The experimental determination of soil structure.—Clod analysis, F. BORNEMANN and PUCHNER (*Mitt. Deut. Landw. Gesell., 28 (1913), No. 5, pp. 77–80*).—Part 1 of this article is a review and criticism of the method of clod analysis of soils proposed by Puchner (E. S. R., 25, p. 22). Part 2 by Puchner gives a reply to the above.

Practical experiences with geological soil mapping in southern Bavaria, W. KOEHNE (*Internat. Mitt. Bodenk., 2 (1912), No. 5, pp. 429–436*).—This is a brief review of the status of geological soil mapping in southern Bavaria and the scope and method of preparation of the soil maps and reports.

Black soils of Oued R'Dom Valley, Morocco, G. GIN (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 23, pp. 1166, 1167; abs. in Rev. Sci. [Paris], 50 (1912), II, No. 24, p. 764; Chem. Zentbl., 1913, I, No. 7, p. 648; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 372, 373*).—The characteristic black color of soils from a fertile river valley near Dar Caïd Ben Ali was found to be due to an amorphous humus substance produced by gradual oxidation of vegetable matter. The process of formation is similar to that of peat and is favored by alternate moistening and drying of the soil.

Plantation soil and its fertilization, E. CARTHAUS (*Tropenpflanzer, 17 (1913), No. 1, pp. 21–32*).—This is a general discussion of the fertilizer needs of the plantation soils of Dutch East India.

The limiting element of plant food in these soils is potash, the soils with low humus content being most deficient in this constituent. The physiological effect of potash on different plants is briefly discussed.

The mixing of high moor and mineral soil, G. A. RITTER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 29, pp. 422–426*).—Such mixture not only improved the physical condition of the soil, but in connection with liming greatly promoted bacterial activity in the soil, particularly nitrification, which occurred

very feebly or not at all in the original moor soil. For an abstract of a more technical account of these investigations see page 727.

"Edaphism," a new theory on the relation between plants and the soil: Its applications to agriculture (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2589–2595*).—"By 'edaphism' is meant the totality of trophic and geographical relations; that is, of nutrition and surroundings, between the plants and the soil; consequently the fundamental problem of edaphism is the study of the liquids of the soil and of the physical, chemical, and climatic factors which may modify their properties."

A bibliography of the more recent literature of investigations bearing on this subject is given and the results of the investigations are summarized, the general conclusions being that "(1) the optimum conditions for an active mineral nutrition, and consequently rapid development of plants are represented by the continual variations of the degree of concentration of the solutions in the soil; (2) every effort of the practical farmer must tend to promote in the soil the formation of such concentrations as by their intensity and duration are the most favorable to the economic development of the various species of cultivated plants."

The bacterial theory of soil fertility, F. Fletcher and E. J. Russell (*Nature [London], 90 (1913), No. 2255, pp. 541–543, fig. 1*).—Fletcher takes exceptions to the conclusions of previous papers by Russell and Petherbridge (E. S. R., 28, p. 119) and Darbishire and Russell (E. S. R., 19, p. 1120) as to the effect of partial sterilization in increasing bacterial activity in "sick" soils, and refers to previous work of his own (E. S. R., 23, p. 722) as showing that complete sterilization increases productiveness more than partial sterilization, thus indicating other causes than increased bacterial activity for this result.

In reply Russell points out that he holds that increased ammonia formation following partial sterilization is only one cause of increased productiveness, and that complete sterilization so completely alters a soil "that it can no longer be compared in any sense with the unheated soil. A considerable amount of decomposition takes place, and much ammonium and other simple soluble nitrogen compounds are formed." He has found no evidence of toxins in either sick or normal soils, but has found "abundant evidence of the activity of organisms detrimental to the ammonia-producing bacteria," and has shown "that partial sterilization destroys these organisms, and that it causes an increase in numbers of ammonia-producing bacteria, in the amount of ammonia produced, and in the fertility of the soil."

Experiments on ammonia formation in the presence of carbohydrates and of other nonnitrogenous organic matter, J. G. Lipman et al. (*New Jersey Stas. Bul. 247, pp. 3–22, figs. 3; Rpt. 1911, pp. 193–212, figs. 3*).—A series of ammonification experiments is reported which showed that the sugars—dextrose, saccharose, lactose, maltose, and mannite—reduced the amount of ammonia recovered from dried blood due, it is suggested, either to a depressing effect upon ammonia formation or to a favorable effect upon organisms which use ammonia and fix it in organic combinations. When not affected by the presence of carbohydrates "the rate of ammonification is fairly proportional to the time elapsing up to the tenth day, and . . . to the amount of material used." Small amounts of starch seemed to have a stimulating effect upon ammonification.

"The amount of ammonia nitrogen recovered from rice flour and corn meal was about the same with the dextrose as without it. With the wheat flour, linseed meal, cowpea meal, soy-bean meal, and cotton-seed meal, on the other hand, the amount of ammonia nitrogen recovered was invariably less when

dextrose was used. With the exception of the rice flour, corn meal, and wheat flour, the amount of nitrogen recovered is approximately proportional to the amount actually used. . . . With the exception of the rice flour and wheat flour, the amount of ammonia recovered was invariably less when starch and saccharose were added to the nitrogenous material; and with one exception, viz, the linseed meal, the amount was less with starch than with saccharose."

The addition of calcium carbonate to the dextrose did not correct the depressing effect of the latter.

Experiments relating to the possible influence of protozoa on ammonification in the soil, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 248, pp. 3–19; Rpt. 1911, pp. 213–229*).—Contrary to results obtained by Russell and Hutchinson, ammonia formation was less when a filtered soil infusion was added to a sterilized soil containing dried blood than when an unfiltered infusion was used. Pasteurization of the infusion had but little influence upon ammonification, although sterilizing the soil practically stopped it. It appears therefore "that the destruction of the protozoa by heat does not enable the bacteria in the soil infusions to produce a larger quantity of ammonia out of dried blood and similar materials." Similar but less pronounced results were obtained with such vegetable substances as corn meal, wheat flour, cotton-seed meal, and soy-bean meal.

Experiments with soils sterilized one, two, and three times showed "that a single sterilization was sufficient for the destruction of all living bacteria." Apparently a very small amount of ammonia was formed in a purely chemical way.

Pasteurized infusion was less effective than nonpasteurized in producing ammonia from both dried blood and cotton-seed meal in sterile soils. "In the nonsterile soils, on the other hand, the influence of either fresh or pasteurized infusion is of secondary importance. . . . Air-dry soil yielded slightly more nitrogen with both the blood and cotton-seed meal than did the moist soil."

Antagonism between anions as affecting ammonification in soils, C. B. LIPMAN (*Centbl. Bakt. [etc.], 2. Abt., 36 (1913), No. 15–18, pp. 382–394, figs. 3; abs. in Jour. Chem. Soc. [London], 104 (1913), No. 604, I, pp. 238, 239*).—In continuation of previous investigations on the effects of alkali salts on soil bacteria (E. S. R., 27, p. 124), the author reached the following conclusions:

"Antagonism between anions as measured by its effects on ammonification in soils has been found to exist between NaCl and Na_2SO_4, between NaCl and Na_2CO_3, and between Na_2SO_4 and Na_2CO_3, or between the anions of the salts mentioned.

"Antagonism is shown most strongly between Na_2CO_3 and NaCl, is next strongest between Na_2CO_3 and Na_2SO_4, and weakest between NaCl and Na_2SO_4.

"The greatest antagonism was noted between 0.2 per cent NaCl and 0.7 per cent Na_2CO_3 of the dry weight of the soil, and the antagonism increased in that series from the point at which 0.2 per cent Na_2CO_3 was added to 0.2 per cent NaCl with a yield of 37.8 mg. nitrogen as ammonia to the maximum yield of 70.7 mg. of nitrogen as ammonia. . . .

"The term 'antagonism' when applied to salts or ions should connote the lowering of the toxicity of the whole medium when one salt is added to one or more others even though the stimulating power of the salt thus added is reduced.

"Antagonism is here shown between toxic and stimulating salts as well as between two toxic salts."

Decomposition of nitrates as a possible cause of formation of carbonate of soda in Egyptian soils, R. ALADJEM (*Cairo Sci. Jour., 6 (1912), No. 75, pp. 301, 302*).—Laboratory experiments are briefly reported which showed that in

a soil kept in a water-logged condition practically all of the nitrate added disappeared and was replaced by an almost equivalent amount of sodium bicarbonate.

The circulation of nitrates in the soil, L. MALPEAUX and G. LEFORT (*Ann. Sci Agron., 4. ser., 1 (1912), II, No. 4, pp. 241–258, figs. 8; Semaine Agr. [Paris], 32 (1913), No. 1651, p. 30; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 2, pp. 188–191*).—Experiments similar to those of Müntz and Gaudechon (E. S. R., 21, p. 621) on the diffusion of calcium and sodium nitrates in boxes of sand and loam soil, showed that simple diffusion was comparatively slow and was practically the same laterally as vertically. Sprinkling accelerated downward as well as lateral diffusion, but there was a comparatively rapid capillary return of the nitrates to the superficial layers of the soil. After a period of 4 months there was little evidence of diffusion at a distance of 6 in. from the center of the boxes where the nitrate was originally placed. The diffusion was somewhat slower but more uniform in the clay soil than in the sandy soil. The general conclusion is that under ordinary conditions of rainfall there is not much danger of loss of nitrates by leaching, but that there is a comparatively rapid diffusion of the nitrates in the surface soil.

The influence of soil moisture upon nitrification, J. W. PATERSON and P. R. SCOTT (*Jour. Dept. Agr. Victoria, 10 (1912), No. 5, pp. 275–282, figs. 3; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 10, pp. 2136–2141*).—The influence of varying amounts of moisture on nitrification was studied in sand and clay soils.

It was found that "nitrification is inactive in these soils while they still contain about three times more moisture than in their average air-dry condition. At the lower limits of moisture less water starts nitrification in sand than in the clay. At the higher limits of moisture less water stops nitrification in sand than in the clay. While the optimum amount of water probably varies for each soil, and is higher for clay, still for both soils it lies within the range of from 14 to 18 parts per 100 of dry soil. A rise above the optimum amount of water is more harmful than an equal fall below it.

"If the summer working of fallow land helps to retain water in the surface soil, this water may have a powerful influence upon the production of nitrates for the next crop. A growing crop may reduce the nitrate supply for the next crop in two ways—it may use up all the nitrates actually present, and it may so dry the land that nitrification in the interval between crops is reduced to a minimum. The moisture requirements for nitrification suggest that in dry seasons a single flooding of fallow land might be followed by good results."

The relation between decomposition of cellulose and the nitrogen economy of nature, H. PRINGSHEIM (*Mitt. Deut. Landw. Gesell., 28 (1913), Nos. 2, pp. 26–29; 3, pp. 43–45*).—This article discusses in some detail the function of the decomposition products of cellulose as sources of food and energy for nitrogen-fixing and transforming organisms.

The associative growth of legumes and nonlegumes, J. G. LIPMAN (*New Jersey Stas. Bul. 253, pp. 3–48, pls. 9*).—The author reviews literature showing that the beneficial effect of associative growth of legumes and nonlegumes has long been known, and reports cylinder, plat, and pot experiments with various combinations of cereals and leguminous plants begun by him in 1908. The pot experiments were made in the greenhouse with a combination of an inner unglazed pot in which the cereal was grown, surrounded by a larger glazed pot in which the leguminous plant was grown, the results obtained by this arrangement being compared with those obtained with a combination of two impervious pots (E. S. R., 24, p. 423).

Summarizing the results obtained, the author concludes that "under favorable conditions nonlegumes associated with legumes may secure large amounts of nitrogen from the latter, even though this may not be indicated by an increased proportion of nitrogen in the dry matter of the nonlegume. The presence of the nonlegume in the mixed growth need not decrease the yields of dry matter and nitrogen in the legume.

"When sodium nitrate is applied to such crop mixtures, the nonlegumes gain an advantage in the competition for moisture, light, and plant food, and the growth of the legume is depressed. The latter contains then not only less of dry matter and nitrogen, but may possess a smaller proportion of nitrogen in the dry matter. The presence of larger amounts of sodium nitrate tends to depress nitrogen fixation by legumes in mixed or unmixed growths. It seems probable that nitrogen compounds pass out of the roots of at least some legumes, and that such nitrogen compounds may become available to the nonlegumes in mixed growths. Legumes seem to differ as to their capacity to supply nitrogen compounds to nonlegumes associated with them.

"When legumes and nonlegumes are grown together, the relative yields of the two are intimately affected by the amount of available nitrogen compounds in the soil. Everything else being equal, the greater the amount of combined nitrogen placed at the disposal of the mixed crop, the greater the relative yield of the nonlegume, and the smaller the relative yield of the legume. Hence, on poor soils, properly inoculated, legumes are more prominent in crop mixtures than nonlegumes.

"In the associative growth of legumes and nonlegumes the development of the latter may be depressed rather than enhanced when factors other than the supply of combined nitrogen limit production.

"The mere determination of the proportion of nitrogen in nonlegumes grown alone and in association with legumes is not adequate for demonstrating that the latter supply nitrogen compounds to the nonlegumes associated with them."

Miscellaneous vegetation experiments, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 250, pp. 3–19; Rpt. 1911, pp. 251–267*).—Cylinder experiments are reported which "clearly indicate that there is an advantage in growing a legume crop on the land and turning this under, over turning under the same amount and kind of material brought from an outside source. This points to an accumulation in the soil of nitrogen from the nodules of the legumes."

In box experiments it was found that "the nitrogen content of soy beans was distinctly increased by the use of lime, though lime at the rate of 4,000 lbs. per acre did not appear to give any increase over the yield from 1,000 lbs. per acre. The highest yield was obtained when the lime was used at the rate of 2,000 lbs. per acre. Gypsum appears to have had no influence on the nitrogen content of the beans. Neither lime nor gypsum appear to have had any appreciable influence on the buckwheat. Boxes receiving 1 gm. and 2.5 gm. of acid phosphate and 10 gm. of lime yielded more nitrogen in the buckwheat than boxes that received 5 and 6 gm. of acid phosphate and 10 gm. of lime."

A sandy soil appeared to favor a high content of protein in soy beans. Decomposing organic matter apparently did not increase the availability of insoluble phosphate (Florida hard rock).

A comparison of acid phosphate, citrate-soluble phosphate, Thomas slag, and insoluble rock phosphate showed little difference in availability. Lime and gypsum compounds containing even small amounts of boric acid were apparently injurious. In soils inoculated with *Azotobacter beyerincki*, lime increased the yield and nitrogen content of corn.

Vegetation experiments as a basis for fertilizer analysis, E. A. MITSCHERLICH (*Fühling's Landw. Ztg., 61 (1912), No. 24, pp. 817–826, figs. 2*).—This

article shows that while vegetation or so-called plant physiological experiments furnish a slow and laborious method of determining the value of a fertilizer, they must be the basis for successful chemical analysis. The experiments must, however, be made under carefully controlled conditions, and in applying the law of minimum to the results of such experiments account must be taken of many other factors besides amount of fertilizing constituents applied. In no case will the yield be directly and exclusively controlled by this law. While the plant assimilates only soluble material its growth will be determined not solely by the solubility of the fertilizer as determined by analysis, but also by the rapidity with which the fertilizing constituents will pass into solution.

Further notes on the law of minimum, H. RODEWALD (*Landw. Vers. Stat., 78 (1912), No. 5–6, pp. 389–399*).—This article discusses especially Mitscherlich's views regarding the law of minimum (E. S. R., 25, p. 825) and its application in the presence of varying conditions of plant growth. The author agrees with Mitscherlich's definition of this law as applied to theoretical conditions, but he maintains that since such conditions can not be secured in practice there is no constant relation in effect between different fertilizers with like fertilizing constituents.

The effects of manures in the various types of soil in the sugar-beet region of southern Russia, S. TULAIKOV (*Khoziaistvo, 7 (1912), No. 36, pp. 1177–1180; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2621–2623*).—Experiments on various types of black soils, transition soils, and forest clays are reported, the general conclusion being that the character of the soil determines the fertilizer required independently of the crop grown.

Barnyard manure, J. W. AMES and E. W. GAITHER (*Ohio Sta. Bul. 246, pp. 725–753*).—This bulletin supplements information contained in Bulletin 183 of the station (E. S. R., 19, p. 720). It contains information derived from experiments at the station and compiled from other sources on the production, composition, conservation, reinforcement, and value of barnyard manure. It shows that the liquid excrement contains nearly half the nitrogen and potash voided by farm animals; "when steers are fed on cement floors the value of the manure produced is more than $4 per year greater for each animal than when fed on earth floors; . . . the least amount of nitrogen will be lost from stored manure if animals are kept on it or it is kept in a moist, well-packed condition; . . . open barnyard manure is about one-half as valuable as stall manure; stall manure appears to be more effective in rendering phosphorus available from floats and other materials carrying phosphorus in slightly available form than yard manure; the addition of phosphatic materials to manure greatly increases its fertilizing value and pays a handsome return for the trouble, for this purpose phosphatic materials [proving] more valuable on most Ohio soils than gypsum or kainit; manure used in connection with continuous cropping will not maintain the maximum yield but when used in connection with crop rotation it increases the yield of all crops grown in that rotation; [and] manure used in conjunction with a complete fertilizer high in phosphorus will give better returns than when either is used alone."

The composition of Russian and foreign fish fertilizer and other marine manures, P. S. KOSSOVICH and G. I. KOLOTOV (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 6, pp. 801–816; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 377, 378*).—A large number of analyses of such materials is compiled and discussed. The fish fertilizers are divided into two groups, (1) those relatively poor in phosphoric acid (not over 7 per cent), and (2) those containing from 12 to 15 per cent phosphoric acid. Russian herring guano belongs in the first class. There

is a third group of marine manures, including such materials as seaweed, containing from 0.6 to 1.6 per cent phosphoric acid. The nitrogen content of the first group varied from 6 to 13 per cent, of the second from 6 to 9 per cent, of the third from 1.4 to 5.3 per cent (in case of Fucus only 0.35 per cent). The potash content of the materials was about 1 per cent. The fat content of the fish fertilizers varied from 4 to 18 per cent, of the other marine manures from 0.7 to 5 per cent.

Home mixing and general fertilizer formulas, W. B. WEST (*South Carolina Sta. Circ. 8, pp. 8*).—Formulas for 40 different mixtures are given.

Home mixing of fertilizers, J. C. RAMPLEY (*South Carolina Sta. Circ. 10, pp. 3–31*).—Formulas for mixtures for different crops are given.

The technical preparation of ammonia out of its elements, F. HABER and R. LE ROSSIGNOL (*Ztschr. Elektrochem., 19 (1913), No. 2, pp. 53–72, figs. 8; abs. in Jour. Indus. and Engin. Chem., 5 (1913), No. 4, pp. 328–330, figs. 4; Chem. Ztg., 37 (1913), No. 17, Repert., pp. 77, 78, figs. 2*).—A technical description of the apparatus and process used by the authors is given.

The use of artificial nitrogenous manures in Austria, F. W. DAFERT (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2547–2550*).—The growth and present status of the use of calcium nitrate and calcium cyanamid in Austria are briefly discussed. Of the former about 1,500 tons was used in Austria in 1912, of the latter about 5,000 tons. The author is of the opinion that as long as the present price of sodium nitrate is maintained the future of the manufacture of the synthetic compounds is assured.

New observations on the behavior of nitrate in cultivated soil, J. VOGEL (*Internat. Mitt. Bodenk., 2 (1912), No. 5, pp. 397–410*).—The investigations here reported have already been noted from another source (E. S. R., 28, p. 521).

Further experiments on the action of various forms of nitrogen, W. SCHNEIDEWIND ET AL. (*Arb. Deut. Landw. Gesell., 1912, No. 217, pp. 171*).—This is a report on pot and field experiments during 1908 to 1911 with rye, wheat, oats, potatoes, fodder beets, and sugar beets to compare sodium nitrate, calcium nitrate (Norwegian and Schlösing), calcium nitrite, lime nitrogen, ammonium sulphate, meat meal, and other nitrogenous fertilizers.

The sodium and calcium nitrates were about equally effective and showed the highest efficiency of any of the fertilizers tested. The results with calcium nitrite were sometimes good, sometimes poor. Ammonium sulphate showed an efficiency in field experiments of 88.5 per cent as compared with 100 per cent for sodium nitrate; in pot experiments 92.5 per cent. Its rate of assimilation in field experiments was 84 per cent, in pot experiments 89.5 per cent. In one year of the series ammonium sulphate was more effective than sodium nitrate for oats and potatoes on both moist and dry sandy soils. As a rule there was a large loss of nitrogen from ammonium sulphate during the winter on light soils. Lime nitrogen was 68.5 per cent as efficient as sodium nitrate in field experiments and 86.5 per cent in pot experiments. As a fall dressing for winter grain it gave somewhat better results. Its rate of assimilation was 64.5 per cent in field experiments and 83 per cent in pot experiments. The meat meal in two experiments with potatoes on dry sandy soils was 86 per cent as efficient as sodium nitrate.

Poor results were obtained with urine on both sandy soils and humus loam.

Fall application of ammonium sulphate on sandy soils gave much poorer results than spring application of sodium nitrate. The results from fall application of ammonium sulphate were better on heavy soils, in one year (with a very dry spring) exceeding those of spring application of sodium nitrate.

Apparently the efficiency of the different applications was dependent very largely upon the character of the season as well as the quality of the soil. On the better soils spring application of ammonium sulphate gave very poor results with winter cereals, but on dry sandy soils spring application gave better results than fall application. Fall application of lime nitrogen gave poor results on sandy soils, but was more effective on these soils when applied in the spring. Fall application, however, gave better results than spring application on heavy soils.

On dry sandy soils fall application of meat meal gave no better results than that of ammonium sulphate. There was a great loss of nitrogen from meat meal during the winter unless the season was very dry.

As a rule large applications of sodium nitrate (equivalent to from 50 to 80 lbs. of nitrogen per acre) gave better results on moist sandy and loam soils than on dry sandy soils.

The availability of nitrogenous materials as measured by ammonification, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 246, pp. 3–36; Rpt. 1911, pp. 159–192*).—Results of studies of the rate of ammonification of dried blood, tankage, fish, cotton-seed meal, peat, and mixed fertilizers, mixed with soil in varying proportions and with various admixtures, are reported, and show that the ammonification method can be relied on to indicate materials that have relatively high or low availabilities. The time element is, however, an important element, "and it is entirely possible that in using this method as an index of the availability of such materials, it may be found necessary to allow a longer period for ammonification. It is well known that the recovery from such materials is greater with crops having a long growing season."

Sodium nitrate was found in certain cases to stimulate ammonification in moist materials like peat. Dried blood, however, was "not only inefficient in promoting ammonification in the peat, but seemed to lose some of its own efficiency." Finely ground dried blood was not more rapidly ammonified than the coarser material.

The addition of so-called stimulants—potassium iodid, and copper, zinc, manganese, ferrous, and calcium sulphates—gave varying and inconclusive results. Phosphates appeared to favor ammonification. The addition of manure infusion to dried blood slightly reduced ammonification.

Conditions affecting the availability of nitrogen compounds in vegetation experiments, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 249, pp. 3–23, fig. 1; Rpt. 1911, pp. 230–250, fig. 1*).—In pot experiments with corn it was found that dextrose slightly depressed nitrogen assimilation. The order of availability of various materials tested in pot experiments with barley was nitrate of soda 77.97, sulphate of ammonia 66.95, blood (average of 8 samples) 40.31, tankage (average of 10 samples) 28.71, fish (average of 10 samples) 40.09, and ammoniates (average of 2 samples) 44.35 per cent. Fineness of division did not affect availability in case of dried blood. Large applications of magnesian lime depressed the assimilation of nitrogen from dried blood and cotton-seed meal.

In cylinder experiments with a rotation of corn, oats, wheat, and timothy, on shale soil and on soil containing varying proportions of sand, it was found "that beginning with 70 per cent of sand there was a distinct decline in the weight of dry matter produced. With no fertilizer and also with dried blood the highest amount of nitrogen recovered was with 20 per cent of sand; where nitrate of soda was used the highest amount was 2.14 gm., with 40 per cent fis sand."

phor In box experiments with alfalfa magnesian and nonmagnesian lime used in cent pal proportions gave practically the same results in yield and nitrogen con- as the same amount of calcium carbonate alone.

Factors relating to the availability of nitrogenous plant foods, J. G. LIPMAN ET AL. (*New Jersey Stas. Bul. 251, pp. 3–55, pls. 7, figs. 2*).—In pot experiments, mostly with barley, it was found that "the largest yield of dry matter and also of nitrogen was with a moisture content of 9 per cent, where nitrate of soda was used. In these pots the percentage of nitrogen was slightly reduced with 9 and 11 per cent of water. . . . The percentage of nitrogen in the dry matter decreased as the percentage of sand in the soil was increased. . . . As the proportion of sand was increased there was a decrease in the weight of dry matter. . . .

"In applications of nitrate of soda ranging from 1 to 5 gm. per pot, the percentage of nitrogen in the dry matter gradually increased from about 1 to nearly 3½ per cent. There was a gradual increase in the recovery of nitrogen with applications of nitrate up to and including 3 gm.; greater quantities resulted in a depressed yield of dry matter, with a consequent lower percentage recovery. . . .

"One gm. of nitrate of soda, with what is termed the single portion of minerals, gave a percentage recovery of nitrogen essentially as great as was given with the double portion of minerals. This combination gave a higher recovery than was obtained with 2 gm. of nitrate of soda and the double portion of minerals.

"In some cases the presence of small amounts of nitrate of soda and sulphate of ammonia slightly increased the availability of nitrogen in dried blood, peat, and leather, and in others there was a depressing effect. The recovery from leather was less than from peat.

"Carbohydrates (dextrose and saccharose) depressed the yield of nitrogen in the crop when nitrate of soda, sulphate of ammonia, and dried blood were used as sources of nitrogen. In most cases saccharose had a greater depressing effect than dextrose.

"In a number of experiments in which a comparison was made between the availability of nitrogen in nitrate of soda, sulphate of ammonia, and dried blood, nitrate of soda almost invariably stood first and sulphate of ammonia second. . . .

"With blood and tankage and also mixed fertilizers containing nitrogenous organic materials it was shown that the percentage recovery of organic nitrogen was usually greatest from those samples having the highest percentage of organic nitrogen. That is, the organic nitrogen of high-grade materials seems, usually, to be more readily available than that of low-grade materials."

The indirect effects of phonolite, H. KASEBER (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1913), No. 3, pp. 271–284; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 379–381*).—In the pot experiments reported it was found that with one exception phonolite reduced the yield when used in connection with nitrogenous fertilizer (sodium nitrate), apparently promoting denitrification.

Composition of the salines of the United States.—III, Brines from the ocean and salt lakes, J. W. TURRENTINE ET AL. (*Jour. Indus. and Engin. Chem., 5 (1913), No. 1, pp. 19–24*).—This is the third paper on this subject (E. S. R., 28, p. 33), and reports chemical examinations of brines obtained from borings in various basins and valleys in Nevada, California, and Oregon, and of mother liquors from solar refineries manufacturing salt from sea water in California.

Borings in the Lahontan basin, Nevada, have so far yielded no brines. Brines from the Searles Lake basin showed from 6.06 to 7.63 per cent of potash. Variable but considerable percentages of potash were found in brines from Railroad Valley, Nevada, and the same was true to a less extent of brines from Death Valley. The mother liquors from the salt works using sea

water contained from 15.6 to 66.7 per cent of potassium chlorid, and have been used successfully for the manufacture of potassium chlorid, the output of this compound at three places in California being about 400 tons per annum.

On the organic origin of the Stassfurt salt deposits, M. Rózsa (*Ztschr. Elektrochem., 19 (1913), No. 3, pp. 109–115*).—Various theories of the formation of these deposits are discussed in the light of original observations by the author.

The use of pure potash in 1890, 1900, and 1910, M. Hoffmann (*Arb. Deut. Landw. Gesell., 1912, No. 216, pp. 55, pls. 13*).—Detailed statistics for amount and distribution of potash used for agricultural purposes in the different German States are given. It is stated that the total amount of fertilizer used in Germany in 1910 was 6,497,183 short tons valued at about $98,500,000. The amount of potash salts used was 2,441,860 tons (equivalent to 395,269 tons of pure potash) valued at $11,000,000.

Lime for South Carolina soils, T. E. Keitt (*South Carolina Sta. Circ. 9, pp. 7*).—Analyses of oyster-shell and other kinds of lime and ground limestone are reported and their use and value as a fertilizer are briefly discussed.

Experiments on the fertilizing action of sulphur, V. V. Sabashnikov (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 6, pp. 817–822, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 381, 882*).—Flowers of sulphur were applied at the rate of 10 gm. per square meter to barley and rye growing on a fertile clay soil, containing 0.082 per cent of sulphuric acid, which had previously been in beets. The effect of the application of sulphur was observed from the beginning to the end of the season in the more vigorous growth and greener color of the crops, and there was a decided increase in the yield.

Increasing the productiveness of soils by means of sulphur, B. Heinze (*Naturwissenschaften, 1 (1913), No. 5, pp. 111–113*).—Previous investigations bearing on this subject are briefly reviewed. Preliminary experiments by the author indicate that the action of sulphur is similar to that of carbon bisulphid but is not entirely biological and is not well understood.

Analyses and valuations of commercial fertilizers, C. S. Cathcart et al. (*New Jersey Stas. Bul. 252, pp. 3–41*).—"This bulletin contains the analyses and valuations of 381 brands of the commercial mixtures, 28 special compounds, and 15 home mixtures. In addition to these, duplicate analyses are reported of 4 commercial brands and also the results obtained with 120 samples of fertilizer materials."

Analyses and valuations of commercial fertilizers and ground bone, C. S. Cathcart et al. (*New Jersey Stas. Bul. 254, pp. 3–51*).—This bulletin completes the report on fertilizer inspection in New Jersey for 1912 noted above. It gives the text of the new fertilizer law approved March 27, 1912, and the rules and regulations adopted in accordance with it; explains the valuation of fertilizers and discusses the quality of the fertilizers examined; reports tests of the method of determining different forms of nitrogen when applied to mixtures containing calcium cyanamid; and gives guarantied and actual analyses and valuations of 536 brands of fertilizers.

It is shown that if calcium cyanamid is used in the preparation of fertilizers "the results obtained for nitrogen from nitrates, ammonia salts, and organic matter, by the use of the official methods, will include a portion of the nitrogen derived from the cyanamid, although the nitrogen in this material does not belong to any of the classes mentioned."

Commercial fertilizers, E. Fulmer (*Washington Sta. Bul. 110, p. 32*).—This bulletin includes a popular discussion of the principles underlying the use of fertilizers; a report on inspection of fertilizers in Washington in 1911 ar

1912, including analyses and valuations of 74 samples, and notes on the use of fertilizers in the State; and the text of the state fertilizer law.

"The sale of commercial fertilizers in the State of Washington has not as yet assumed any considerable proportions, the total sales probably not exceeding 1,500 tons per year. Each year, however, there is an increasing demand, particularly in the region tributary to Puget Sound."

AGRICULTURAL BOTANY.

Report of the assistant bacteriologist, M. MULVANIA (*Tennessee Sta. Rpt. 1910, pp. 98–103, figs. 3*).—A brief account is presented of the results of some of the studies carried on by the bacteriologist, particular attention being paid to the relation of bacteria to humus, fertilizers, etc.

A form of flask is described by the use of which it is believed a more accurate knowledge of the relation of various species of bacteria to the formation of humus in soils may be obtained. Tests have been made with this flask and the soil kept sterile for months, although an abundant supply of air and water was available.

In the progress of his investigations the author found it necessary to grow plants under bacterial control, and a method is described which has proved very satisfactory in this respect. A form of apparatus was devised in which plants were grown in sterile soil supplied with water and air, yet the conditions were so controlled that plants were grown for three months and remained entirely sterile. In connection with the use of this apparatus the author found it desirable to sterilize the seeds, and this was readily accomplished by subjecting the seeds for 15 minutes to a 1:500 solution of methyl violet, after which the seeds were washed in sterile water, then put into a 1:500 mercuric chlorid solution for 20 minutes, and again washed and planted. The seeds so treated were repeatedly tested and found almost invariably free from bacteria and fungi.

Contributions on lower plant organisms, particularly bacteria, of high and low moor lands, in floristic, morphological, and physiological relations, G. A. RITTER (*Centbl. Bakt. [etc.], 2. Abt., 34 (1912), No. 23–25, pp. 577–666*).—Besides a list and brief review of related literature, the author gives an elaborate discussion of his extended observations and experiments carried out on the cryptogamic flora of the lowlands, as regards numbers; morphological, systematic, and physiological relations; comparison of moor lands with mineral earths in respect to bacteria; the capability of the moor lands to support bacteria; and the Remy method of estimating bacteria in soils.

Culture studies with chlorophyll-bearing micro-organisms.—I, Culture of algæ in agar, E. G. PRINGSHEIM (*Beitr. Biol. Pflanz., 11 (1912), No. 2, pp. 305–333, pls. 2, fig. 1*).—A number of green lower forms were studied in regard to their development in agar and their utilization of ammonia and nitrates.

The Oscillatoriaceæ and the Diatomaceæ thrived most luxuriantly in agar. Both seemed to show little preference between nitrate and ammonia, also the consistency of the agar seemed to play but little part. Other plants examined gave a great variety of results, particulars of which are given in detail.

The invertase of Aspergillus niger.—The influence of carbonaceous food on the secretion of enzyms, G. GRÉZES (*Ann. Inst. Pasteur, 26 (1912), No. 7, pp. 556–573, fig. 1; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 600, II, pp. 976, 977*).—The fact that *A. niger* produced invertase in much larger quantity when the nutritive medium contained sucrose than when this was replaced by sodium succinate led to repeated cultivation in the latter medium with a view to producing finally this fungus without invertase. After 60 generations,

however, it still contained the enzym, and when further cultivated on sucrose the original enzymotic activity was restored.

The physiology of colorless sulphur bacteria, F. KEIL (*Beitr. Biol. Pflanz., 11 (1912), No. 2, pp. 335–372*).—As a result of investigations carried out with Beggiatoa and Thiothrix, it is stated that both these oxidize hydrogen sulphid and separate sulphur, which is oxidized to sulphuric acid. The sulphuric acid is neutralized by carbonates, the presence of which, like hydrogen sulphid, is necessary to the growth of these bacteria. They are also able to thrive in a solution entirely free from organic substances, and these, though not hurtful in moderate concentrations, do not contribute to growth. Both organisms employ ammonium salts as a nitrogen source, and carbon dioxid is their only known source of carbon.

Fertilizing crops with carbon dioxid, A. HANSEN (*Naturw. Rundschau, 27 (1912), No. 43, pp. 547–550; abs. in Chem. Zentbl., 1912, II, No. 26, p. 2135*).—Reference is made to previous work by Godlewsky and Hugo Fischer showing a marked increase in the dry matter produced by various plants when supplied with an increased amount of carbon dioxid. The author also refers to his own observations that the growth of grass was much more vigorous in the vicinity of certain natural sources of carbon dioxid. The results of pot experiments which he made with barley and certain garden crops confirm those of Godlewsky and Fischer, and he is of the opinion that the growth of crops might be increased by this means in the open field, since the carbon dioxid would not be lost but would be energetically absorbed by the chlorophyll coloring matter and assimilated by the plant.

Assimilation of carbon dioxid and respiration in varieties of the same species as distinguished by leaf coloration, W. PLESTER (*Beitr. Biol. Pflanz., 11 (1912), No. 2, pp. 249–304, fig. 1*).—Investigations with 40 varieties of about 15 species, comprised in 13 genera and including trees, shrubs, and herbs, are said to show that in some cases, as of Mirabilis, Populus, and Ptelea, a close parallelism exists between the assimilation and chlorophyll content of the leaves, while in others, as Ulmus, Tropæolum, and Atriplex, assimilation runs ahead of green coloration. It is thought that in the latter cases other means of breaking up carbon dioxid may be possessed. *Catalpa bignonioides aurea* shows a lower assimilative activity than its chlorophyll would indicate. In the variegated plants assimilation varies greatly, as in case of *Acer pseudoplatanus luteo-virescens*, but it lies between that of normally green and that of light-green plants. All studies show a limited respiration in the case of the light-green plants, the smallest relative respiration of normal leaves appearing in case of *C. bignonioides aurea*. A relation is thought to exist between respiration and assimilation, the ratio of the two varying somewhat but lying not far from 1.66 : 1. In general the light-colored leaves show low assimilative activity.

In the red-leafed plants no relation was found between the chlorophyll and anthocyanin present, and both respiration and assimilation lagged behind that of the normally green plant of the species. Light appears to play an important part in this process. In cloudy weather this difference is accentuated. The results of numerous experiments are given in detail, and a bibliography is appended.

The first stages of carbon dioxid separation in sprouting seeds, O. JAUFRKA (*Beitr. Biol. Pflanz., 11 (1912), No. 2, pp. 193–248, pls. 2, figs. 4*).—As the result of experiments with seeds of many species of monocotyledons and dicotyledons, the author states that in the early stages of germination, dur[illegible] which a distinct heightening of respiration occurs, the processes appear to [illegible]ing almost wholly chemical. Respiration seems to be the result of enzymo[illegible] be activity and dependent largely upon temperature and quantity and quality [illegible] the [illegible] of

materials at hand; that is, upon the kind of seed. No new enzyms form, apparently, in dead plasma, but enzyms present may continue active for a time. Apparently in such cases formation of carbon dioxid takes place anaerobically and not through oxidation. Such persisting enzyms become after a time inactive under the influences of heat and light, respiration then ceasing.

A relation apparently exists between germinability and intensity of respiration. Water content and changes in moisture appear to be of significance in connection with both of these processes. Carbon dioxid formation in the early stages of ordinary germination appears to be largely independent of temperature in case of any one seed and to occur in somewhat characteristic amount in each seed tested. In this connection both the anatomical structure and the nature of the reserve materials appear to be of significance; the former to rapidity of sprouting, the latter to intensity of respiration.

The determination of the respiratory quotient, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci.* [*Paris*], *155* (*1912*), *No. 19, pp. 881–886, figs. 2; abs. in Jour. Chem. Soc.* [*London,*] *102* (*1912*), *No. 602, II, pp. 1201, 1202*).—Attention is called to the difficulty of determining the true respiratory coefficient of plants, and a mathematical discussion is given of the relationship between the real and apparent respiratory coefficients. Two methods are described for determining this relationship which show close agreement. By the aid of the formulas given various plants which were experimented with were found to absorb carbon dioxid at all temperatures at about double the rate that the gas was absorbed by pure water.

The determination of the real respiratory coefficient, L. MAQUENNE and E. DEMOUSSY (*Compt. Rend. Acad. Sci.* [*Paris*], *155* (*1912*), *No. 22, pp. 1055–1060, fig. 1*).—In continuation of the above report on the relative and real coefficients of respiration, the authors give the results of the application of their method to the study of a number of species of plants.

It was found that in leaves with thin parenchyma, in which gas exchange takes place easily and rapidly, either the vacuum or the displacement method can be used in determining the respiratory coefficient. In case of fleshy leaves, stems, or germinating seeds the method of displacement is believed to be the only one giving results corresponding to those actually occurring.

The physics of transpiration, II, O. RENNER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 572–575*).—Starting with the fact, shown by experiments with water in dishes and with moistened paper, that in very quiet air the amount of evaporation from moist surfaces is not precisely proportional to the exposed area, but that the amount given off is relatively greater for small surfaces, the author experimented with leaves divided along the midrib, the wounds having been carefully closed with cacao butter. In case of *Syringa vulgaris*, *Aconitum lycoctonum*, and *Aster* sp., the dissected leaves gave off from 12 to 13 per cent more moisture than did the entire leaves. It is believed that the difference is not very important with such leaves as those of lilac, especially where the air has not been kept very quiet.

The problem of enzym synthesis.—III, Diastase and starch of plant tissues, H. C. BRADLEY and E. KELLERSBERGER (*Jour. Biol. Chem., 13* (*1913*), *No. 4, pp. 425–429*).—The authors made a study of 14 plants, mostly common cultivated species, in regard to the relation between the occurrence of diastase and that of starch in plant tissues, of which about 100 in all were examined with very divergent results. The findings as regards starch are exhibited in tabular form.

Leaves generally contain starch. In some it is found always, in others only while photosynthesis is in rapid progress. Diastase is, as a rule, most abundant in the leaves, where starch is never stored permanently. Leaves of different species exhibited marked differences in diastase content. In leaves of bay-

berry, onion, and leek the presence of the enzym is doubtful, but the leaves of the legumes contained the most active enzyms examined.

It is concluded that no general deductions can be drawn relating to the diastatic activity of a tissue to its starch-storing function. The fact that practically all of the starch-storing tissues contain diastase is not considered as conclusive in view of conflicting evidence.

Experimental contributions to a theory of antagonistic activity of ions, I, J. Szücs (*Jahrb. Wiss. Bot. [Pringsheim], 52 (1912), No. 1, pp. 85–142, figs. 22*).—As a result of extensive experimentation, the author concludes that the so-called antagonistic action of ions is due, in the cases investigated, to the limiting effect of one on the other as to the rate at which they are taken up by tissues. It is stated that a complete parallelism exists between the intensity of an ion in such limitation on another and the degree of so-called poisoning observed.

Lime-magnesia ratio as influenced by concentration, P. L. Gile (*Porto Rico Sta. Bul. 12, pp. 24, pls. 4*).—Earlier work along these lines is reviewed, and a report is given of experiments with upland rice in which the plants were grown in culture solutions from 40 to 50 days, and to the nutrient solution varying amounts of calcium and magnesium chlorids were added. The main purpose of the experiments was to determine whether there is a definite ratio of the bases lime and magnesia at which the plants grow best when the lime and magnesia are present as chlorids, and to see whether the effect of the ratio would be evident at all concentrations.

As a result of his experiments the author states that the ratio of lime to magnesia has not so much to do with the condition of the plants as has the relation between whatever salt is in excess and all the other salts; that is, the question is not the simple one of a balancing of lime with magnesia, but a balancing of lime or magnesia with all the other nutrients. The general conclusion is reached that the toxicity of an excess of lime or magnesia is not due simply to an unfavorable ratio between these two salts, but to an unfavorable proportion between the salt which is in excess and all the other salts present.

Plants which require sodium, W. J. V. Osterhout (*Bot. Gaz., 54 (1912), No. 6, pp. 532–536, figs. 2*).—A description is given of experiments undertaken to learn whether there are cases in which sodium is as necessary for plants as for animals. One flowering plant and several genera of algæ were studied, the method of investigation consisting in replacing sodium chlorid of sea water by the chlorids or sulphates of a number of other substances.

It was found that sodium is as necessary for the marine plants studied as for animals, and that its replacement in sea water by ammonium, calcium, magnesium, potassium, barium, strontium, cæsium, rubidium, or lithium is decidedly injurious. The best substitutes for sodium are the other cations which predominate in the sea water, namely, magnesium, calcium, and potassium. The behavior of various species toward certain salts indicates that each of these salts has a specific action on life processes.

Stimulative and depressive effects of chromium compounds on plants, P. Koenig (*Chem. Ztg., 35 (1911), Nos. 49, pp. 442, 443; 51, pp. 462, 463; abs. in Bot. Centbl., 120 (1912), No. 4, pp. 110, 111*).—Besides a review of related literature, the author gives an account of his own investigations.

It was found that every compound of chromium tested was taken up by the plants. Chromic acid and its salts appeared markedly injurious to plants, other chromium compounds less so, especially in dilute form. In soils and water cultures chromic acid proved less hurtful than chromates, the bichromate of potassium being the most injurious.

The germination experiments showed that the plants sprouted in the culture medium were the most sensitive to chromium poisoning; followed by those started in sand; while the least susceptible were those grown in good soil. The injurious effect seems to depend upon the capacity for adsorption of the nutritive medium. Stimulation was noted in case of moderately strong or dilute solutions of several chromium compounds. Plants containing silica and oxalic acid proved least sensitive to chromium poisoning.

Investigations were carried out to ascertain the marks of chromium poisoning, the establishment of tolerance, etc., and recovery of chromium from the plants which had taken it up.

The production of chlorophyll under the action of light, P. A. DANGEARD (*Bul. Soc. Bot. France, 59 (1912), No. 6, pp. 466–468, fig. 1*).—In order to test the common claim that chlorophyll is formed in plants under exposure to any portion of the solar spectrum, the author exposed etiolated leaves of chicory to the spectrum obtained through a spectroscope and a Nernst lamp. After exposure for 24 hours the green color began to appear in certain parts of the leaves. At the end of 4 days it was found that the maximum chlorophyll production had taken place in the region of absorption band I of chlorophyll, with a second area in the vicinity of absorption band II. The results of this experiment were confirmed with etiolated shoots of potatoes and cress seedlings.

The influence of radioactivity on the development of plants, J. STOKLASA (*Chem. Ztg., 36 (1912), No. 142, pp. 1382, 1383; Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 22, pp. 1096–1098*).—A study was made of the radio-active substance nasturan, pitchblende, which is said to have a radium content of 0.000136 gm. per kilogram. Varying quantities of this substance were placed in glass vessels and inclosed in jars containing plants growing in Knop's solution and so arranged that the roots came in contact with the glass. Where the amount of the radio-active material was more than 0.5 gm. an injurious effect was noted in every case in the growth of maize.

A second series of experiments was carried on with radio-active waters from wells at Joachimsthal. In these experiments the germination and development of wheat, barley, vetches, peas, lupines, and clover were studied. The results obtained showed that radio-active water favored the growth in every instance. Experiments with various species of bacteria, however, showed that the radio-active water retarded the development of bacteria with the exception of *Azotobacter chroococcum*.

The influence of uranium and lead on plants, J. STOKLASA (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 2, pp. 153–155*).—In continuation of the above experiments, the author investigated the effect of salts of uranium and lead. The experiments were made in large pots, the salts being added in increasing quantity in the different series. Oats and buckwheat were grown.

The nitrate of uranium in small quantity seemed to stimulate plant growth, but when used in large amounts it was detrimental. Lead was much more actively toxic than uranium. The results indicated that both uranium and lead in the form of nitrates and in very dilute solution increased the growth of plants, and these results were confirmed by field tests.

Electromotive phenomena in plants, A. D. WALLER ET AL. (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, p. 173*).—Continuing observations previously reported (E. S. R., 26, p. 227), the authors give a brief account of investigations on pea and bean seedlings.

In these it was found that the normal electric current runs from the cotyledons up the stem and amounts sometimes to 0.08 volt, while the blaze current runs from the growing tip toward the cotyledons. Cutting the stem across causes a current from the cut end of 0.02 volt or more, which lasts for about

half an hour. A sharp touch sends a current from the point touched, and even the touch of a fine hair on young stems will cause a current from that point.

The relative effects of water, salt solution, ether, and chloral on the blaze current in case of hyacinth root tips were also studied. In water the blaze increased from 0.008 volt to 0.03 in three days; in salt solution it decreased from 0.008 volt to 0.004; in ether, from 0.007 volt to 0.0013; and in chloral, from 0.002 volt to 0.0001.

The influence of electricity on the respiration of germinating seeds, J. H. PRIESTLEY and R. C. KNIGHT (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 604, 605*).—Experiments were carried out to determine the relative amounts of respiration going on in germinating seeds under normal conditions and under the influence of electricity, such respiration being taken as a measure of the activity of the vital processes. Peas were used for the most part.

Direct currents varying from 0.75 to 9 milliamperes produced a decrease in respiration of from 20 to 30 per cent, the higher currents producing a slightly larger decrease. Under the same conditions with the current rapidly reversed the rate of respiration was affected by the current, 50 microamperes producing an increase of about 30 per cent, while 150 microamperes had no effect and from 500 to 600 microamperes resulted in approximately 20 per cent decrease. The best results were obtained by connecting the positive pole of an electric machine with a platinum loop just above the seeds, the latter being connected with the earth, and thus passing a discharge into the seeds. After the provision was made to absorb the ozone, the results became regular and respiration was increased by the discharge, varying with the seeds used, the largest gain being 110 per cent with peas.

Some effects of bacteriotoxins on the germination and growth of plants, W. B. BOTTOMLEY (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, pp. 584, 585*).—It was found that an aqueous extract of well rotted manure on fertile soil, obtained by treating 100 gm. of manure or soil with 500 cc. of isotonic salt solution and filtering through a Pukall filter, has an injurious effect on the germination of seeds and their further growth in sand even when supplied with normal food solution, but that this inhibitory effect can be destroyed by boiling the extract. It is thought that the harmful effect is due to the presence of bacteriotoxins, as toxalbumoses, due to the activities of decomposing or denitrifying bacteria in the manure or soil.

Support was given to this theory by experiments with germinating seeds of mustard, turnip, vetch, and barley, as the raw extract almost prevented both germination and subsequent growth, while the boiled extract, at first slightly retardative to germination, soon showed an accelerative action on growth.

The unboiled extract was also found to stimulate the growth of denitrifying bacteria, while inhibiting the growth of nitrogen-fixing bacteria, both these effects being neutralized by boiling.

See also a previous note (E. S. R., 28, p. 628).

The effect of anesthetics upon permeability, W. J. V. OSTERHOUT (*Science, n. ser., 37 (1913), No. 942, pp. 111, 112*).—On account of the difference of opinion regarding the effect of anesthetics (chloroform, chloral hydrate, ether, and alcohol) on permeability the author has carried on a series of experiments with living tissues of Laminaria by measuring their conductance. Under the conditions of the experiment an increase or decrease of conductance would signify a corresponding increase or decrease of permeability. The anesthetics used were mixed with sea water and the conductivity brought up to normal by adding sufficient concentrated sea water.

Two distinct effects were noticed in the experiments, one of them showing a toxic effect, as evidenced by an increase in permeability, while the other

involved a decrease in permeability. The conclusion is reached that the reversible change, involving a decrease of permeability, is associated with the anesthetic action.

It was found that typical anesthetics decrease the permeability of the tissue to ions, and this is considered significant in view of the fact that the transmission of nervous and other stimuli is believed to depend on the movement of ions within the tissues.

Observations on the alterations in the wood of grapevines as a consequence of wounding, L. Petri (*Staz. Sper. Agr. Ital., 45 (1912), No. 7, pp. 501–547, pl. 1, figs. 7*).—The author's investigations regarding the cause of the changes following pruning operations showed the constant presence in the brown streaks of two fungi belonging to the genera Cephalosporium and Acremonium. The gummy-resinous formation is thought to be the direct result of wounding (though it goes through some degenerative changes). The fungi are apparently a secondary feature, which, however, may spread the injury to portions of the wood distant from the original points of injury.

The nature of the absorption and tolerance of plants in bogs, A. Dachnowski (*Bot. Gaz., 54 (1912), No. 6, pp. 503–514*).—In continuation of a previous account (E. S. R., 26, p. 821), the author describes experiments with sorghums, alfalfa, and beans to determine the physiological effect of bog water upon them. From these and other experiments he concludes that the problem of absorption is not one of simple solution, but an intricate and coordinated process.

Summarizing his observations, he states that physiological investigations of peat soils indicate clearly that the obligate bacterial flora and the organic compounds produced form a very important factor in the relative fertility of peat soils, in the causes of vegetation succession, and in the distributional and genetic relationships of associations. In considering the different behavior of the plants in the bog water solution it is concluded that the difference is not in the solution alone, but in the condition of the plants as well. Certain organic compounds were found to penetrate eventually the protoplasmic membrane of absorbing organs and inhibit growth, and this is ascribed to the influence exerted upon the plasmatic membrane, to the differences in its diosmotic properties, and to the pathological changes which accompany the absorption of the injurious substances. In some plants peat soil solutions are precipitated in an insoluble form. In others the different organic carbon and nitrogen compounds arising through the activity of micro-organisms may be absorbed and assimilated.

In conclusion the author believes that the phenomena of absorption and tolerance of plants in bogs deal not with osmotic pressure relations so much as with considerations of the permeability of the absorbing protoplasmic membrane, its power of endurance, and its ability by enzymic action either to absorb and assimilate or to transform injurious bodies into insoluble, impermeable compounds.

Œnothera and climate, R. R. Gates (*Science, n. ser., 37 (1913), No. 943, pp. 155, 156*).—As a result of studies of several series of seedlings of *Œ. grandiflora* and *Œ. lamarckiana*, the author concludes that probably all Œnotheras of this group are biennial in their native localities, and not annuals, as is often claimed. It is further stated that in growing, in the climate of England, a great many wild races of different species of Œnothera indigenous to North America, the constancy and peculiarity of each race was maintained, indicating that each race is closely adapted to the conditions of the growing season in its own native locality.

Ingrowing sprouts of Solanum tuberosum, C. S. GAGER (*Bot. Gaz., 54 (1912), No. 6, pp. 515–524, pl. 1, figs. 6*).—A detailed account of observations on the abnormal growth of potatoes, a preliminary account of which has been given (E. S. R., 26, p. 828).

Inheritance of the russet skin in the pear, R. WELLINGTON (*Science, n. ser., 37 (1913), No. 943, p. 156*).—A brief note is given on observations made on the inheritance of the russet skin which is found in different varieties, ranging from 0 to 100 per cent.

A study of the varieties mentioned in a bulletin on the Nomenclature of the Pear (E. S. R., 20, p. 44) showed a comparatively low number of russet individuals, indicating that this factor is recessive to the smooth-skinned condition. Observations made of hybrids at the New York State Station confirm this conclusion.

FIELD CROPS.

[Report on field crops], F. C. MINKLER (*New Jersey Stas. Rpt. 1911, pp. 46–54, pls. 5*).—This report covers the work of the year, chiefly with corn, oats, alfalfa, Canada field peas, cowpeas, Kafir corn, rye, wheat, vetch, soy beans, and mixed hays.

Due to the severe and unfavorable winter the alfalfa roots were badly heaved out of the ground, but the author believes that the large amount of seeds used at seeding time provided an abundance of surplus plants, so that in spite of the many plants being thrown out of the ground a yield of 5 tons per acre was secured during the season. It was noted that where lime had been applied abundantly heaving was noticeably less.

In trials with corn "cattle corn" produced 8.3 tons in September, as compared with 8.2 tons of Golden Ruby in 1910 on the same land. Because of the leafy, juicy stalks these varieties are considered well suited for early cutting as green feed for cattle and swine. Hill Acres Best, a leafy white dent corn, is reported to have made a remarkable growth, 4 acres producing 31 tons, 450 lbs. of silage.

An application of 2 tons per acre of sludge (residue from glue factories and leather tanneries), made with a manure spreader, is reported to have shown beneficial results with corn, oats, peas, rye, and vetch. It is noted that the sludge may be stored in unprotected heaps without deterioration.

In trials with oats and Canada peas it was concluded "that where it is impossible to store sufficient corn silage for summer use oats and peas make a splendid silage, although the yield per acre is less and the cost per ton greater. It is more economical to ensile the oats and peas rather than cut green and feed daily as green forage; first, because it enables seeding of the entire area at one time rather than at successive intervals of 10 days each; second, because the crop can be harvested when reaching ripeness and maturity rather than making the first cutting when the plants are too green and the last cuttings when the crop is too ripe, as is the case under the soiling system; third, the early plantings are not troubled with the pea louse, as is the case with later plantings; fourth, the feed is equally as palatable, costs less to handle, and is more convenient, as rainy days and wet ground greatly interfere with satisfactory every-day cuttings; and, fifth, one is able to have the use of the ground at an earlier period, thus enabling the planting of a summer crop such as soy beans, cowpeas and Kafir corn, oats and barley, or any other crop suited to the farmer's need."

A yield of from 6 to 9.9 tons per acre of forage for the silo was secured by drilling a mixture of 1 bu. of cowpeas and 14 qt. of Kafir corn per acre on oat and pea stubble late in July. A cover crop mixture consisting of 60 lbs. of

rye or wheat, 15 lbs. of winter vetch, 8 lbs. of crimson clover, and 2 oz. of Cow Horn turnip is pointed out as having given highly satisfactory results.

Forage crop experiments at the San Antonio field station, S. H. HASTINGS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 106, pp. 27, pls. 4, fig. 1*).—This circular gives results of experiments conducted during the years 1907–1912, inclusive, for the purpose of testing forage crops not generally known and to test the best methods of planting and tillage of those best suited to the region.

Tests of sorghum varieties showed in 1908 Sumac and Red Amber to be best suited to this region. The average yields for 4 years with Sumac were 2.84 tons per acre when planted in rows 4 ft. apart, and 1.96 tons when planted in 8-in. drills. It also gave 4.19, 4.36, and 4.15 tons, respectively, when planted in rows 2, 3, and 4 ft. apart, and 3.3, 2.76, 2.05, and 1.97 tons per acre, respectively, with plants 2, 4, 7, and 8 in. apart in the row. In 8-in. drills it yielded, with seedings at the rate of 26, 37, 52, 88, 121, 153, and 174 lbs. per acre, 4.54, 4.97, 5.12, 5.27, 5.01, 4.55, and 4.9 tons per acre, respectively.

A test of the band and row method of sowing a sorghum and cowpea mixture showed best results with the row method, as fully 50 per cent of the cowpeas died by the band method. Of different rates of seeding sorghum and cowpea mixture, 74 plants of the former and 100 of the latter per 50-ft. of row gave the largest yield, 5.15 tons per acre.

Of 7 varieties of oats tested, Appler Rust Proof gave the best results, with a yield of 2,624 lbs. of hay per acre. It is pointed out that the rate of seeding, based on weight alone, of 2 varieties is not necessarily comparable, and that the size of the seed is an important factor, for the lowest rate of 23 lbs. carrying approximately 828,000 seeds per acre of Culberson winter oats produced the highest yield of that variety, while 59 lbs. per acre, the highest rate of Appler Rust Proof, which carried only 950,000 seeds, gave the highest yield for that variety. The yields obtained of 13.5 tons in 1910 and 11.95 tons in 1911, under irrigation, indicated that Japanese sugar cane would be a valuable addition to the list of forage crops to be grown under irrigation in this section.

In a clover test crimson clover gave a yield of 1,240 lbs. and sweet clover 1,640 lbs. per acre. Cowpeas promised to be one of the best forage crops, yielding under ordinary conditions from 1½ to 2½ tons per acre. A complete failure of the crop had never been recorded. Whippoorwill and Unknown varieties have proved to be the best. Canada field peas when planted alone gave better results than when sown with oats, yielding 1.94 tons per acre. A test of the millets indicated that these do not make a desirable crop for this section. Other crops reported are Para grass, guinea grass, Rhodes grass, lentils, mung beans, chick peas, guar, vetches, soy beans, rape, and peanuts.

[Fertilizer experiments], P. ANDOUARD (*Bul. Sta. Agron. Loire-Inf., 1910–11, pp. 37–47*).—An application of a magnesium fertilizer containing 35 per cent magnesium oxid and 55 per cent calcium hydrate at the rate of 1,500 kg. per hectare (1,335 lbs. per acre), increased the yield of wheat 1,050 kg. per hectare, of hay 900 kg., and of beans 12 kg., while with cabbage there was a decrease of 3,770 kg., and no influence appeared with maize. An application of 300 kg. of carbonate of manganese per hectare resulted in a slight increase in the case of wheat, beets, and spinach, and negative results with oats, kidney beans, potatoes, clover, and buckwheat. An application of 30 kg. of powdered boric acid proved of no benefit to oats, wheat, kidney beans, potatoes, clover, or turnips.

Experiments in lighting growing plants at night, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 368–373*).—This paper reports negative results on the growth of potatoes, barley, lettuce, and tomatoes under the influence of arc lights which emitted red rays and of mercury lights suspended in the field 2½ meters above the crops each night during their growth.

Annual report of the Agricultural Experiment Station at Harleshausen, E. HASELHOFF (*Jahresber. Landw. Vers. Stat. Harleshausen, 1911–12, pp. 32*).—This reports the experimental work in progress in the laboratory, vegetative house, and fields, together with the control work in fertilizers, seeds, feeds, milk, and plant diseases.

In an experiment to study the influence of nitrogen in urea, uric nitrate, and galalith on barley and mustard, it was found that the nitrogen of the galalith produced good results, although not equal to those with either of the other forms. The nitrogen in Burkheiser salts did not prove so valuable as that in ammonium sulphate in a test with buckwheat and mustard.

Report on the Partabgarh Agricultural Station for the year ending June 30, 1912, L. C. SHARMA (*Rpt. Partabgarh Agr. Sta. United Prov. Agra and Oudh, 1912, pp. 9*).—Analyses of soils and subsoils are given, with reports of trials of 5 varieties of rice transplanted and sown broadcast, 9 varieties of maize, jute, peanuts, 17 varieties of sugar cane and millet, the application of gypsum to reclaimed waste land, and experiments to prevent damage due to erosion of embankments.

Report on the progress of agriculture in India for 1910–11 (*Rpt. Prog. Agr. India, 1910–11, pp. 85, pls. 3*).—This report contains a description of the work with agaves, coffee, cotton, flax, peanuts, indigo, jute, rice, rubber, sugar cane, tea, tobacco, and wheat. Other work reported includes that with irrigation, alkali lands, dry farming, manures, sericulture, and poultry.

Methods of work and new apparatus of the plant breeding station of the Agricultural Institute of the University of Halle, F. WOHLTMANN (*Kühn Arch., 2 (1912), pt. 1, pp. 231–272, figs. 8*).—This paper includes a description of the experiment station field and plats with mechanical and chemical analyses of the soils. A new hand apparatus for the planting of individual seeds in a breeding plat is described that is claimed to overcome some of the difficulties involved in hand work, such as accurate spacing, uniformity in depth, and in compacting the soil on the seed, besides being more rapid. An average of 3,500 seeds, with a maximum of 6,000, can be planted per hour. The results of trials with a new hand seed drill are given with various grains.

Methods of harvesting the breeding plats, with descriptions of the apparatus used in the laboratory for taking lengths, thickness, and breaking strength of the straw, weights and sizes of grain, and the record sheets for individual plants and varieties are described and illustrated.

The breeding of agricultural plants.—V, The breeding of colonial plants, C. FRUWIRTH ET AL. (*Die Züchtung der landwirtschaftlichen Kulturpflanzen. Vol. 5, Die Züchtung kolonialer Gewächse. Berlin, 1912, pp. XIX+184, figs. 32*).—This comprises a series of articles on plant breeding by various authorities with reference to the improvement of the following crops: Sugar cane, rice, sorghum, millet, coffee, cacao, citrus fruits, cotton and other fiber plants, sweet potatoes, manioc, peanuts, oil palms, olives, and sesame.

Statistics on the production of cereals and legumes, 1912 (*Estadistica de la Producción de Cereales y Leguminosas en el año 1912. Madrid: Govt., 1912, pp. 30*).—This contains tables of yields and areas devoted to the following crops in 13 regions of Spain by provinces, with comments upon each region: Barley, beans, canary seed, chick pea, kidney beans, maslin, millet, oats, peas, rye, vetch, and wheat.

The stiffness of the stems of grains, C. KRAUS (*Beitr. Pflanzenzucht, 1912, No. 2, pp. 14–31*).—The author seeks a correlation between the stiffness of the stalk and the kernel-producing factors of the grains. He discusses (1) the internal causes of stiffness, such as the morphological construction of the stem,

the anatomical construction of the stem wall, the mechanical qualities of the stem fiber, the developing process of the stem, the stability of the stem in the soil, and the system of the whole plant skeleton, and (2) the outer causes of stiffness, viz, environment, method and intensity of cultivation, and selection and breeding.

Alfalfa, F. F. MATENAERS (*Der Luzernebau. Berlin, 1912, pp. XII+207, figs. 37*).—This book covers the whole subject of alfalfa from its early history to present-day systems of culture, harvesting, and curing. It is divided into 11 chapters and deals largely with scientific and experimental work done in the United States. The author precedes his work with a list of American and German publications on the subject from which it was compiled.

Hardiness in successive alfalfa generations, L. R. WALDRON (*Amer. Nat., 46 (1912), No. 548, pp. 463–469, figs. 2*).—This paper is a discussion based on some work previously begun (E. S. R., 24, p. 124), and continued by using seeds secured from plants of the old nursery that showed various degrees of hardiness. The progeny showed as a rule marked increase in hardiness. Thus, a Utah strain that killed out 59.6 per cent had killed but 6.2 per cent in its offspring, and there were but 3 instances of the offspring killing more severely than the parent. Another Utah strain killed 42.8 per cent in a total of 76 plants, and its offspring but 3.5 per cent from a total of 131 plants.

Alfalfas were selfed in 1909 from both hardy and tender strains of alfalfa. A selfed Mexican plant had progeny that showed absolute hardiness during the winter of 1910–11, while the mother plant killed 24.5 per cent. Others of the selfed alfalfas acted in the same manner, producing offspring behaving radically different from the parent strain.

Cooperative experiments in alfalfa culture, H. J. WHEELER ET AL. (*Rhode Island Sta. Bul. 152, pp. 86, pls. 6*).—This bulletin reports the results of 52 cooperative experiments conducted during the years 1909 to 1912 with the most hardy varieties of seed obtained from the Bureau of Plant Industry of this Department, and arranged to test the value of ground limestone, magnesian limestone, water and air slaked lime, soil and artificial inoculation, and commercial fertilizers in securing a stand and increasing productivity.

About 50 per cent of the trials report an increase in yield by the use of lime, some of them being as much as 8 times greater than where no lime was used. About 25 per cent showed a greater benefit from slaked lime than from magnesium limestone. In a few instances inoculation increased the yield.

Experiments in fertilizing alfalfa, R. W. THATCHER and G. A. OLSON (*Washington Sta. Popular Bul. 49, pp. 4*).—The first year's experiments resulted in the following yields: With ground lime rock 2.6 tons of hay per acre, land plaster 4.6 tons, acid phosphate 4.2 tons, floats 2.5 tons, and nitrate of soda 3.7 tons, as compared with 2.6 tons, the average of 5 check plats. A table of analyses shows than an increased amount of nitrogen, potash, phosphoric acid, lime, and sulphur was removed from the land plaster and phosphate plats.

A variety of maize with silks maturing before the tassels, G. N. COLLINS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 107, pp. 11, figs. 3*).—The author points out the advantages that might be gained by combining the proterogynous habit of a variety of maize that was introduced from Spain with the good qualities of the American types to obviate the necessity of detasseling in cross fertilization. A description of this new variety with some of its abnormalties is given.

Breeding maize for industrial purposes, L. H. SMITH (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 261–264*).—The author uses the results obtained in corn breeding to vary the protein, starch, and oil content at the Illinois Experiment Station (E. S. R.,

20, p. 531), to illustrate the possibilities in breeding for special industrial purposes. The high protein strain in 1911 yielded 13.78 per cent and the low protein strain 7.89 per cent of protein; the high oil strain yielded 7.51 per cent, and the low oil strain 2.05 per cent of oil.

Corn culture for Texas farmers, B. YOUNGBLOOD (*Texas Dept. Agr. Bul. 23, 1912, pp. 42, figs. 15*).—This bulletin gives advice as to the zones in the State where corn may be depended upon as the only grain crop, with notes as to scientific methods of seed selection and breeding, germination tests, preparation of seed beds, cultivation, fertilizers, rotations, harvesting, storing, cost of production, etc.

Results of 7 years' cotton experiments at Maha-Iluppalama (*Trop. Agr. and Mag. Ceylon Agr. Soc., 40 (1913), No. 1, pp. 11, 12*).—In 4 of the 7 seasons reported, the crops were partial or total failures, and in the remaining 3 less than half of a good crop (about 1,000 lbs. of seed cotton per acre) was obtained.

Göttinger oats, I, II, III, IV, O. TORNAU (*Göttinger Hafer I, II, III, IV. Inaug. Diss., Univ. Göttingen, 1911, pp. 91*).—This dissertation discusses the characteristics of 4 varieties of oats originated at Göttingen.

The average thickness, width, and length of kernels of the 4 varieties coincide closely with those of former investigations, and are as 1 : 1.2 : 6.1. The weight of 1,000 kernels varied from 31.2 gm. to 34.5 gm.

Notes were also made on the germination, stooling, time of flowering, and maturing of the grain in both pot and field experiments. Further notes include the characteristics of the heads, straw, and roots of the individual plants. A bibliography is appended.

The potato, E. H. GRUBB and W. S. GUILFORD (*Garden City and New York, 1912, pp. 545, pls. 63*).—This subject is covered in 42 chapters, including every phase of cultivating, harvesting, and marketing, and with chapters on special uses, cooking, manufacture, legislation, exhibition, and scoring, the recent development in the various sections of this country as well as foreign countries, history, botany, and physical and chemical composition, and an appendix on the world's food problem, including statistics.

Potato growing, O. M. MORRIS (*Washington Sta. Bul. 9, spec. ser., pp. 6*).—This bulletin contains instructions for growing potatoes by boys and girls, as well as a general discussion of the best methods used in the State, and a note on preparing potatoes for exhibition.

Culture experiments with the blue swamp potato (Solanum commersonii violet), W. SCHIKORRA (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 388–395*).—Experiments on light and heavy soils to throw light on the identity of this potato indicated that it was not different from the ordinary *S. tuberosum* varieties, Alma, Yellow Rose, and Blue Giant.

Report of the Wisconsin Potato Growers' Association, 1912 (*Ann. Rpt. Wis. Potato Growers' Assoc., 1 (1912), pp. 16, pl. 1*).—This report contains the constitution and by-laws of the association, with brief summaries of papers presented at the Waupaca meeting, November 14 and 15, 1912, as follows: Relation of the University Horticultural Department to the Potato Industry in Wisconsin, by J. G. Moore (pp. 6–8); Relation of Potato Diseases to the Seed Trade, by L. R. Jones (pp. 8, 9); Relation of Seed Selection to Commercial Standards, by C. L. Fitch (p. 9); Leguminous Crops for Northern Wisconsin, by E. J. Delwiche (pp. 10, 11); Potato Growing in Relation to Land Settlement, by B. F. Faast (pp. 12, 13); Potato Production in Maine, by H. G. Bell (pp. 13–15); and Commercial Potato Growing on Northern Sandy Soil, by H. D. Baker (pp. 15, 16).

Teff (Eragrostis abysinnica), J. BURTT-DAVY (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1913, No. 1, pp. 32–39; Agr. Jour. Union So. Africa, 5 (1913),*

No. 1, pp. 27–37, figs. 2).—A note is made of the early introduction of this grass from Abyssinia by the Royal Botanic Gardens, Kew, into British Guiana, India, Australia, and Natal, and the recent results obtained in the Transvaal.

Tabulated analyses of the hay show it to be high in food value, containing 6.21 per cent protein, 1.21 per cent ether extract, 39.08 per cent carbohydrates, and 39.07 per cent crude fiber, as compared with 5.65 per cent protein, 3.87 per cent ether extract, 44.04 per cent carbohydrates, and 34.22 per cent crude fiber in oat hay. Both cattle and horses are reported to relish it greatly as hay or pasturage. The grain analyzed as follows: Water 15.2 per cent, protein 8.2 per cent, carbohydrates 68.1 per cent, ether extract 2.8 per cent, crude fibre 2.8 per cent, and ash 2.9 per cent.

The Canadian Seed Growers' Association and its work, edited by L. H. NEWMAN (*Ottawa, 1912, pp. 64, figs. 13*).—In discussing the work of this association, consideration is given regarding the seed question, systems adopted, process of producing stock seed, registration of seed, and the handling of registered seed. A bibliography is appended.

HORTICULTURE.

[Report on botanical investigations], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1911, pp. 313–382, pls. 27, figs. 2*).—This report includes a brief general review of the botanical investigations of the year, additional data on the inheritance studies with corn and peppers (E. S. R., 27, p. 740), notes and data on a study of the phyllotaxy of the sunflower, and a preliminary study dealing with the elongation of the hypocotyl of the soy bean, cowpea, sunflower, buckwheat, radish, tomato, and marrow bean, as influenced by definite amounts of light, heat, moisture, depth of planting, distance apart of planting, position of seeds in the soil, size of seed, interrupted gravitation, and mutilation. See also a previous note (E. S. R., 28, p. 39). Measurements were also made of the hypocotyls of Norway maple (*Acer platanoides*) growing in various situations.

The work with corn during 1911 consisted largely in securing material for a study of xenia in other factors than color and texture. To this end field, pop, and husk corns were grown in the breeding plats. The general results secured in each plat are noted. Further observations on the form of flintiness, which is classed as an ear or plant character, continue to indicate that this form of flintiness is not readily transmitted through cross pollination to adjacent pure sweet grains.

The chief aim in the breeding work with peppers thus far has been to determine the relative importance of various factors as lines of study of inheritance. A large number of commercial varieties were grown during the year. Observations on these varieties deal with the seed, seedlings, plant, flower, and fruit structure. Notes are also given on some pepper crosses.

Report of progress, B. H. A. GROTH (*New Jersey Stas. Rpt. 1911, pp. 386–388, pls. 3*).—In addition to a brief statement of progress made in the study of heredity and correlation of structures in tomatoes (E. S. R., 27, p. 742) and in selection for increased cell number in the fruit of the prairie berry, a preliminary experiment to determine the physiological effects of various fertilizer salts and color solutions applied in large quantities on different plants is described. A few preliminary notes relative to the second generation tomato crosses are included.

The selection for many-celled fasciated fruits among the best strains of the prairie berry has shown a marked advance. The highest number of seed cavities found has risen from 6 cells in 1908 to 13 cells in 1911.

The work with salts and color solutions thus far shows that the plants differ considerably in their sensitiveness to the various poisons. Eosin, for instance, was deadly to some plants within 12 hours. In other plants it developed peculiar color markings. Some plants seemed to be entirely indifferent, while still others seemed to be benefited by a small amount of eosin.

Report of progress, E. J. OWEN (*New Jersey Stas. Rpt. 1911, pp. 389–399, pls. 2*).—This consists of a progress report on the inheritance studies with beans, eggplants, okras, and various ornamentals, together with additional data on the yield limitation experiments with various vegetables (E. S. R., 27, p. 740).

Intensive culture of vegetables on the French system, P. AQUATIAS (*London, 1913, pp. 192, pls. 6, figs. 28*).—A popular treatise on intensive vegetable gardening, the successive chapters of which discuss early history, principles of the intensive cultivation of vegetables, planning a French garden, tools and other appliances, calendar of operations, melon cultivation, cucumber cultivation, mushrooms, seed saving, and vegetable and animal pests.

Report on cabbage culture, edited by D. LEHN (*Arb. Deut. Landw. Gesell., 1912, No. 213, pp. 44*).—An account of cultural, variety, and fertilizer tests of cabbage conducted by T. Remy at the Agricultural Experiment Station at Bonn-Popplesdorf.

Experience in the use of sulphur as a fertilizer for turnips in 1912, A. MAGNIEN (*Jour. Soc. Nat. Hort. France, 4. ser., 14 (1913), Jan., pp. 54, 55*).—A preliminary test of sulphur as a fertilizer for turnips in 1912 indicates that it has a beneficial effect on both the vegetative growth and the yield of turnips.

Experience in the use of sulphur as a fertilizer for beets, A. MAGNIEN (*Jour. Soc. Nat. Hort. France, 4. ser., 14 (1913), Jan., pp. 55, 56*).—A preliminary test similar to that noted above indicates that sulphur has a beneficial effect on the vegetation and yield of beets.

Report of the horticulturist, M. A. BLAKE and A. J. FARLEY (*New Jersey Stas. Rpt. 1911, pp. 63–82*).—This comprises an outline of horticultural projects under way, including additional data on the peach investigations at High Bridge and Vineland (E. S. R., 27, p. 798) and on long-continued fertilizer experiments with apples (E. S. R., 22, p. 141). A cold-storage test of early and late varieties of peaches conducted in cooperation with the training school at Vineland is also described.

Severe winter injury to fruit buds of certain varieties of peaches was observed during 1911. The injury was attributed to the severe drought in the previous summer which stopped growth and development. The varieties are here classified as hardy, half hardy, and tender. In connection with the winter treatments with lime-sulphur and the summer treatment with lime-sulphur-lead arsenate, the cost data of the various applications of spray were secured. The results from the cold-storage test of peaches indicate that both early and late varieties may be kept well in storage to at least late in September, providing the fruit has been effectively sprayed, carefully handled at all times, and stored in a constant low temperature. The temperature in the experiment varied from 28 to 32° F. from 12 o'clock midnight until 12 o'clock noon each day. The fruit held up well for several days after removal from storage.

The yield data from the fertilizer experiments with apples are here brought up to date. The results as a whole thus far show that the applications of phosphoric acid and potash in the form of ground bone, acid phosphate, and muriate of potash had greatly increased the yields of apples of all varieties tested, except the Baldwin. Nitrate of soda used in addition to the other elements caused a more vigorous growth of twigs and foliage, but had little

effect upon the yield of fruit for several seasons. In recent years, however, the trees to which nitrate of soda was added have made distinct gains in yield.

Report of the horticulturist, C. A. KEFFER (*Tennessee Sta. Rpt. 1910, pp. 106, 107*).—A brief progress report on the work of the year.

A test was made of several kinds of orchard heaters during the spring of 1910. Although the test was not conclusive as to the practical value of orchard heating, in point of economy the coal burners were superior with coal costing $4 per ton and crude oil 6 cts. per gallon. No difference was noted between temperatures in the coal heated and petroleum heated orchards, the temperature being raised 4° above the temperature outside of the orchard limits in both cases.

Results of orchard manuring experiments in 1909–10, J. SURÁNYI (*Kisérlet. Közlem., 16 (1913), No. 1, pp. 61–73*).—Results of orchard manuring experiments conducted under the direction of the Imperial Hungarian Experiment Station for Plant Culture at Ungarisch-Altenburg indicate that fertilizers can be used with beneficial results, especially on the sandy soils of that country.

A new method of fertilizing fruit trees, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 8, pp. 239, 240, figs. 3*).—In this note the author advocates the use of organic manure when the tree is first planted and the subsequent application of commercial fertilizers from year to year in a series of holes distributed around the tree about on a line with the circumference of the crown. The depth of the holes is to be increased as the tree becomes older, and the fertilizer is to be well mixed with soil or other material to prevent burning the roots.

The new method of fertilizing fruit trees, A. CADORET (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), No. 13, pp. 407–409, figs. 3*).—Notes are given on experiments conducted in the spring of 1912 to determine the value of the above system of fertilizing fruit trees. The holes in which the commercial fertilizer was placed were about 2 in. in diameter, from 4 to 5 in. deep, and about 20 in. apart. Forty gm. of fertilizer, containing 20 gm. of superphosphate, 10 gm. of nitrate of soda, and 10 gm. of muriate of potash, was placed in each hole. The experiments as conducted at 4 different places all showed an increased vigor both for young and old trees and greater fruit production on bearing trees.

Among the advantages pointed out of this method of fertilizing are the rapidity and economy of application, the possibility of renovating orchards growing in sod without plowing, avoidance of mechanical injury to tree roots, and the application of fertilizer in the immediate vicinity of the feeding roots.

The author suggests the desirability of determining the depth of the feeding roots for various trees in different soils in order to fix the optimum depth of the holes.

Winter injury to fruit buds of the apple and the pear, O. B. WHIPPLE (*Montana Sta. Bul. 91, pp. 33–45, figs. 20*).—A discussion of the causes and effect of winter injury, based upon observations made following the winter of 1910–11.

An examination of a large number of varieties, including those considered the most hardy in the Northwest, revealed the fact that practically dormant fruit buds of the apple and pear may be severely winter injured while the adjoining wood shows no injury and that the injury may be so severe as to prevent fruiting and at the same time be overlooked. In most cases observed the injured fruit buds developed and opened, producing normal leaves but usually no flowers. The injured fruit buds resembled the normal branch buds during what should have been their blooming season, the embryo flowers being pres-

ent but hardly noticeable in their dry and shriveled state. The great similarity at the end of the growing season of fruit spurs that had naturally taken an off-year and those which would have formed flowers had the buds not been injured in midwinter leads to the suggestion that crop shortage in the so-called "off-year" may possibly be attributed to winterkilled fruit buds rather than to the lack of fruit-bud formation. An examination of the meteorological data for the winter of 1910–11 as compared especially with the minimum temperatures during other winters suggests that the presence of a high wind during the thawing period of the buds is a more important factor in causing winter injury than low temperature.

When the injured embryo flower buds were not entirely killed, the fruit buds opened and many types of malformed flowers developed. In several instances where both stamens and pistils were wanting parthenocarpic development of fruit was observed.

The geographic distribution of cherries, Prunus subgenus Cerasus, E. KOEHNE (*Mitt. Deut. Dendrol. Gesell., 1912, No. 21, pp. 168–183*).—Tabular data with explanatory notes are given showing the geographic distribution of cherries, with especial reference to the cherries of central and eastern Asia. Some 120 species are here grouped to conform with the classification used by the author in Sargent's Plantae Wilsonianae, part 2, 1912.

Peaches for Pennsylvania, J. P. STEWART (*Ann. Rpt. Penn. Dept. Agr., 17 (1911), pp. 651–657*).—In addition to concise cultural directions, the author gives a descriptive list of the principal varieties of peaches now in cultivation in Pennsylvania.

Different methods of reconstitution, E. ZACHAREWICZ (*Rev. Vit., 39 (1913), No. 999, pp. 165–168*).—A discussion of different methods of propagation employed in the reconstitution of vineyards on resistant stocks.

The reconstitution on a chalky soil, A. VERNEUIL (*Rev. Vit., 39 (1913), No. 1000, pp. 211–216*).—Observations on the adaptation of various grape stocks on soils of a high lime content are given.

The variation in production of grafted vines with age, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 34 (1913), No. 9, pp. 257–264*).—Tabular data are given showing the yields for 28 consecutive years of 2 varieties of European grapes grafted on various American stocks and grown in the vineyard of the National School of Agriculture at Montpellier, France.

Although considerable decadence is noted in the vines grafted on certain stocks, the decline in yield and vigor is attributed to such causes as variation in the degree of resistance to phylloxera, unseasonable weather conditions, lack of adaptation to specific soil conditions, etc., rather than to the influence of grafting and old age. The general deduction is made that under proper conditions grafted vines are no more subject to deterioration with age than ungrafted vines.

Why is cap-stemming difficult? W. CRUESS (*Pacific Rural Press, 85 (1913), No. 10, p. 293*).—Some preliminary tests conducted at the University of California indicate that one cause of difficulty in the cap-stemming of seedless raisins is the excess moisture in the berries. Laboratory tests show that the berries may be improved either by cooling to make them firm or by drying them out in order to reduce the final moisture content to that of normal raisins.

A raspberry-strawberry (*Canad. Hort., 36 (1913), No. 4, p. 94, fig. 1*).—A cross between the raspberry and strawberry originated by J. E. Hopkins 8 years ago and which fruited abundantly during the past year is illustrated and described.

Citrus fruits and their culture (*San Bernardino, Cal., 1913, pp. 71*).—This comprises a bibliography of scientific and popular literature covering practically

all phases of citrus culture, prepared under the direction of the San Bernardino Free Public Library.

Notes on the banana, W. FAWCETT (*West India Com. Circ., 27 (1912), Nos. 346, pp. 4–6; 347, pp. 28–31; 348, pp. 54–56; 349, pp. 79–81; 350, pp. 103, 104; 351, pp. 125–127; 352, pp. 148–150; 353, pp. 172–174; 354, pp. 198–200; 355, pp. 222, 223; 356, pp. 247–250; 357, pp. 268–271; 358, pp. 293–295; 359, pp. 316–318; 361, pp. 364, 365, pls. 3, figs. 7*).—In addition to summarizing experience relative to banana cultivation in Jamaica consideration is given to the botany of the banana, banana diseases, uses of the banana, and cost of establishing a plantation. A general review is also given of the cultivation of bananas and plantains throughout the Tropics, together with a list of species of Musa-producing edible fruits.

Discussion and investigation of the floral biology of the olive, C. CAMPBELL (*Ann. Bot. [Rome], 11 (1913), No. 1, pp. 209–227*).—The author's investigations lead him to conclude that partial abortion of many female flowers of the olive represents a condition of fixed mutation capable of being perpetuated asexually. He also concludes that although the species *Olea europaea* is described as having axillary inflorescence the occurrence of terminal inflorescence is more or less frequent, and he submits the hypothesis that the terminal inflorescence is the ancestral form and can be reproduced sexually. Forms in which the axillary flowers dominate are considered as cultural forms which have been brought about by various cultural influences, but more especially asexual propagation. Injudicious selection of propagating wood is believed to be responsible for much deterioration in olives.

[Report on experimental shipments of pineapples], C. FULLER (*Union So. Africa Dept. Agr. Rpt. 1910–11, pp. 364–369*).—A summarized account is given of experimental shipments of small and large pineapples from Natal to London, including suggestions relative to the best methods of packing, shipping, and marketing the fruit.

On the desirability of removing the hard shell of the coffee bean before planting, S. BOOM (*Meded. Proefstat. Malang, 1912, No. 4, pp. 1–3, pl. 1*).—The tests here reported show a more rapid germination and a higher germination percentage when the shell of the coffee bean is removed previous to planting.

The genus Iris, W. R. DYKES (*Cambridge, England, 1913, pp. 245, pls. 48, figs. 30*).—A descriptive account of the various sections, groups, and species of the genus Iris. Consideration is also given to the structure, distribution, and classification of the iris, iris diseases and their remedies, iris hybrids, raising irises from seed, and the production of orris root.

A list is given of unidentified specific names, together with a list of plants formerly described as irises, and an extensive bibliography of the iris. Although the specific descriptions were prepared largely in the library of the Kew Herbarium, the work has been checked by a study of the available herbarium material in various countries. The leading types of iris are illustrated in color.

FORESTRY.

Forest commissioner's report, F. E. MACE (*Rpt. Forest Comr. Maine, 9 (1912), pp. 188, pls. 16*).—Part 1 of this report, which comprises the annual report of the forest commissioner for the years 1911–1912, deals largely with the administration of the forests with special reference to fire protection and includes a financial statement for the years. A report of the forestry department of the University of Maine is appended.

Part 2, The Wood-Using Industries of Maine, by J. C. Nellis (pp. 83 185) comprises a statistical study made by the Forest Service of the U. S. Department

of Agriculture in cooperation with the State of Maine to ascertain the extent to which the lumber produced in Maine is further manufactured in the State and how much lumber consumed by wood-working establishments is procured elsewhere. The data given and discussed show the utilization of lumber both by species and by industries. A list is also given showing the uses of wood in the manufacture of various articles, together with a directory of wood-using plants in the State.

Some aspects of European forestry, A. B. RECKNAGEL (*Forestry Quart., 11 (1913), No. 1, pp. 41–57*).—This is the first of a series of articles sketching various phases of European forestry from the American standpoint. The present article deals with the Prussian Forest Service and the administration of the Prussian forests.

On thinning experiments, G. SCHOTTE (*Skogsvårdsför. Tidskr., Fackafd., 1912, No. 6, pp. 387–445, figs. 13*).—A review of the literature dealing with methods of thinning forests, including a description of thinning experiments planned by the Swedish State Forestry Experiment Station. A bibliography on the subject is given.

Method for regulating the yield in selection forests, W. J. MORRILL (*Forestry Quart., 11 (1913), No. 1, pp. 21–27*).—The method herein described is intended for application in small timber sales.

Eric outlook system, F. B. KNAPP (*Forestry Quart., 11 (1913), No. 1, pp. 1–4, fig. 1*).—The system used in New Hampshire for the detection of forest fires is here described and illustrated.

Investigations on the elasticity and strength of Austrian building timbers.—IV, Larch from the Wienerwald, Schlesia, north and south Tyrol, G. JANKA (*Mitt. Forstl. Versuchsw. Österr., 1913, No. 37, pp. VIII+116, pls. 5, figs. 2*).—The investigations here reported at length are similar to those conducted with spruce and previously noted (E. S. R., 22, p. 541). The elasticity and strength determinations are reported in a series of tables and discussed.

The preservative treatment of wood, I. W. BAILEY (*Forestry Quart., 11 (1913), No. 1, pp. 5–20, pls. 2, fig. 1*).—This comprises the two following contributions from the Laboratory of Wood Technology of the Harvard School of Forestry: I, The Validity of Certain Theories Concerning the Penetration of Gases and Preservatives into Seasoned Wood (pp. 5–11); and II, The Structure of the Pit Membranes in the Tracheids of Conifers and Their Relation to the Penetration of Gases, Liquids, and Finely Divided Solids into Green and Seasoned Wood (pp. 12–20).

A bibliography relating to the structure of the wood is included.

The life history of the flower of Manihot glaziovii and the production of pure seed, P. ARENS (*Meded. Proefstat. Malang, 1912, No. 4, pp. 4–16, pl. 1*).—This comprises observations on the blooming habit and seed production of the Ceara rubber tree.

On the existence in West Africa of two staple forms of Hevea brasiliensis, which show a variation in the production of latex, C. M. BRET (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 6, pp. 478, 479*).—A study of mature and seedling trees has shown that there are two distinct forms of *Hevea brasiliensis* cultivated in West Africa, one of which yields a much greater quantity of latex than the other. The two forms may be readily distinguished by an anatomical study of the base of the petioles, the low-yielding form showing few and the high-yielding form many lactiferous ducts. The more vigorous form of the two gives the lower yield of latex.

A new rubber plant in Mexico, R. OLSSON-SEFFER (*Hacienda, 7 (1912), No. 7, pp. 215–218; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and*

Plant Diseases, 3 (1912), No. 9, pp. 1984, 1985; Hawaii. Forester and Agr., 10 (1913), No. 1, p. 8).—An account is given of a rubber-producing plant belonging to the genus Plumeria of the family Apocynaceæ, which yields a latex containing about 25.5 per cent of rubber and 21.9 per cent of resin. The tree grows in hilly country in dry and stony soils and is easily reproduced by slips. Experiments conducted at the Botanical Station of Tezonapa indicate that the best method of procuring the rubber is by extraction from the young parts of the plant, since the prunings have been found to contain a quantity of rubber in excess of that of the trunk. Pruning the young parts of the tree likewise improves its condition and increases the growth of the extraction material.

DISEASES OF PLANTS.

Some new species of Rhizopus, J. HANZAWA (*Mycol. Centbl., 1 (1912), No. 12, pp. 406–409, pl. 1*).—The author gives an account of his studies on pure cultures of five species of Rhizopus not previously determined but provisionally named *R. kasan* II and III, *R. tanekoji* a and b. and *R. bankul.* As a result of these studies, the first three of these were named *R. kasanensis* n. sp., *R. trubini* n. sp., and *R. usamii* n. sp. The other two are said not to be new, but to agree with *R. japonicus* and *R. oryzæ*, respectively.

Spore formation in rust and smut fungi, E. WERTH and K. LUDWIGS (*Ber. Deut. Bot. Gesell., 30 (1912), No. 8, pp. 522–528, pl. 1*).—This is a brief account, with illustrations, of some studies on *Puccinia malvacearum* and *Ustilago antherarum*, as types of rust and smut fungi respectively, in regard to their modes of spore formation as bearing upon the relationships of these two families of fungi.

Conditions of formation of coremia in Penicillium, M. MUNK (*Mycol. Centbl., 1 (1912), No. 12, pp. 387–403*).—The so-called coremia, bearing asexual spores, are thought by the author to be of importance in classification, being known to occur only on Penicillium, grown in nutritive solutions.

Control of insects and diseases in grove, garden, and field, Mrs. N. M. G. PRANGE (*St. Augustine, Fla., 1912, pp. VIII+167, figs. 14*).—Compiled accounts are given describing different diseases and insects that affect crops in the grove, garden, and field, and suggestions are offered for their control.

The preventing of the stinking smut of wheat, H. B. HUMPHREY (*Washington Sta. Popular Bul. 48, pp. 3*).—The results of a series of investigations on seed treatment of wheat with copper sulphate and formalin solutions are given. The variety of wheat used was one of the hybrids originated at the station, and generally believed to be very susceptible to smut. Different strengths of solution were used in the experiment and the time varied from 2 minutes to 2 hours, with the result that all treated wheat was clear of smut.

The effect of the treatment on unbroken smut balls showed that many of them, although subjected to fungicides and soaked until they sank in the solution still retained a considerable proportion of vitality in their spores.

The problem of seed treatment at the station seems to be complicated by the fact that a considerable number of smutted heads from one year's crop are left lying in the open field, from which the subsequent crop may be infected.

Better means for control of stinking smut and loose smut of wheat, C. FUSCHINI (*Staz. Sper. Agr. Ital., 45 (1912), No. 8, pp. 549–586*).—Germination and infection experiments are said to show that *Tilletia tritici* may be safely controlled by the use of copper sulphate solution (from 0.5 to 1 per cent), formaldehyde (from 0.1 to 0.5 per cent), or lysoform (3 per cent) applied to the seed grain. Experiments looking toward the production of a wheat more resistant to *T. tritici*, conducted during three years, gave very encouraging

results. *Ustilago tritici* was controlled by similar treatment with a solution of copper sulphate (1 per cent) formaldehyde (from 0.5 to 1 per cent), or lysoform (3 per cent). The germinability of most kinds of wheat tested was not impaired when lime was used in connection with copper sulphate.

See also a previous note (E. S. R., 27, p. 47).

Report of the botanist, S. M. BAIN (*Tennessee Sta. Rpt. 1910, pp. 96–98*).—Brief summaries are given of the investigations that have been carried on under the direction of the botanist, particular attention being paid to clover diseases and resistance to disease. During the season covered by this report the perfect stage of the fungus *Colletotrichum trifolii* was discovered. The success attained in breeding disease-resistant clover is noted, and the experiments have been extended to include a study of other instances of disease resistance.

Cotton wilt disease, E. J. BUTLER (*Rpt. Agr. Stas. Cent. Prov. and Berar [India], 1911–12, pp. 87, 88*).—The results are given of a study of varieties of cotton resistant to the wilt disease.

Three of the more common varieties were planted in pots in soil taken from fields known to be infested with the fungus. Every plant of one variety was destroyed by wilt, all but two of the second variety, while of the third variety 19 out of 21 plants survived, and the death of the other two plants was due to borers rather than to the fungus. Observations were made on the occurrence of wilt in a number of villages, and it is believed that this disease is responsible for damage in the case of more than 90 per cent of the infected plants examined.

Bacterial gum diseases, F. T. BROOKS (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1911, p. 602*).—The author briefly discusses some studies made by others on a gum disease of sugar cane, ascribed to *Pseudomonas vascularum;* a bacterial disease of cherry trees, due to *Bacillus spongiosus;* and a mosaic disease of tobacco plants, thought to be due to some physiological disturbance within the plant.

Fungi parasitic upon insects injurious to sugar cane, A. T. SPEARE (*Hawaiian Sugar Planters' Sta., Path. and Physiol. Bul. 12, pp. 62, pls. 6, figs. 2*).—According to the author, there are known to be 2 species of fungi in Hawaii growing on the sugar-cane borer beetle, 2 upon the sugar-cane mealy bug, and 2 upon the leaf hopper. Notes are given on *Entomophthora pseudococci* n. sp. and *Aspergillus parasiticus* n. sp., both of which are parasitic on the sugar-cane mealy bug; on *Metarrhizium anisopliæ* on the cane borer beetle; and a sterile Cordyceps on the sugar-cane leaf hopper. The new species are technically described. A bibliography is appended.

Cucumber and muskmelon wilt, G. H. COONS (*Mich. Farmer, 140 (1913), No. 1, pp. 1, 2, figs. 2*).—This is a brief discussion of the cucurbit wilt ascribed to *Bacillus tracheiphilus* (E. S. R., 27, p. 44), its symptoms, test, favoring conditions, and treatment.

The organism works in the water tubes, cutting off the water supply and generating a characteristic ropy slime. Hot, dry summers are thought to do much to check the disease. Insects help to spread the infection. Prompt removal and destruction of all infected vines are recommended.

Nematodes in pepper, G. MALPICA (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 35, 1912, pp. 24–32, pl. 1*).—This is a brief discussion of the work of nematodes on red pepper and a few other cultivated plants. Rotation with nonsusceptible crops and applying chemical manures are said to have proved beneficial.

A disease of tanias, S. F. ASHBY (*Jour. Jamaica Agr. Soc., 16 (1912), No. 11, pp. 576–579; noted in Agr. News [Barbados], 12 (1913), No. 280, p. 80*).—The

author describes a disease of the plant variously known as tania, cocoe, yautia, etc., which is attributed to a fungus that is believed to be hitherto undescribed.

The fungus enters the water-conducting system, cutting off the water supply, and causing an effect resembling that of drought. It is said to gain entrance only through wounds or through the seed or eye of the tuber.

Some varieties are especially subject to attack of the fungus, and where the chances for infection are favorable it is recommended that diseased material should never be planted, nor should a susceptible variety be planted on land known to be infected.

The fungus has been given the name *Hormiscium colocasiæ* n. sp.

Does Phytophthora infestans cause tomato blight? H. S. Reed (*Phytopathology, 2 (1912), No. 6, pp. 250–252*).—While it is commonly believed that *P. infestans* can infect both the potato and tomato, the author claims that there is no direct proof of this in literature, and he reports a number of experiments carried on in 1911 and 1912, which show that it is possible to infect tomatoes and potatoes with the blight by taking spores from either host plant. He says there is some evidence that the disease may be transmitted by tomato seeds, as the fungus mycelium is readily found in the seeds of infected fruit, but the viability of the mycelium has not been demonstrated. He thinks it is probable that most epidemics of tomato blight start from the potato.

Experiments on remedial methods have been carried on, and the greatest success has been obtained from the use of Bordeaux mixture as a spray. Some varieties, like Red Cherry and Red Pear, are completely immune to the blight, but thus far no resistant hybrids have been produced. Among the larger-fruited varieties Red Rock and Buckeye State have shown the greatest resistance.

A rust of tarragon, E. Noffray (*Jour. Agr. Prat., n. ser., 24 (1912), No. 52, p. 818*).—This is a brief account of a rust, *Puccinia tanaceti*, said to attack *Artemisia dracunculus*, its uredospores forming cinnamon-brown spots on the lower leaf surfaces in summer and fall and rendering the plant unfit for use. Removal and destruction of affected leaves is recommended.

On flower and branch blight or Monilia blight of fruit trees, J. Eriksson (*K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 6, pp. 464–478, figs. 9; Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 65, pp. 17, figs. 9*).—After describing the diseases of cherries, apples, and other fruits due to Monilia, the author suggests methods for combating them. These include careful examinations of affected trees before the winter buds have opened, and cutting off and burning all affected parts. This treatment should be followed by thorough spraying with 2 per cent Bordeaux mixture. If dead flowering branches appear within 2 or 3 weeks after blossoming they should be cut off at once and burned. Later, repeated examinations should be made as necessary. Spraying with 2 per cent Bordeaux mixture in June should be made in case of the appearance of any dry branches, and finally all rotted and mummified fruits should be gathered and burned to prevent the spread of the disease the following spring.

Some studies on plant diseases, R. Laubert (*Ztschr. Pflanzenkrank., 22 (1912), No. 8, pp. 449–457, pl. 1*).—The author gives an account of a study of a disease of sour cherries, characterized by witches' brooms and deformity of twigs and leaves. This is said to be caused by a species of Exoascus or Taphrina. Its treatment consists in the removal and destruction of all infected parts. A sunburn of apples and a similar injury of cherries in the unusually hot summer of 1911 are also noted.

A new fungus on the apple, J. W. Roberts (*Phytopathology, 2 (1912), No. 6, pp. 263, 264*).—While investigating the cause of a canker disease of the Yellow Newtown Pippin, the author isolated a fungus which appeared to cause the

disease and which does not seem to have been hitherto described. A description of the fungus, *Phomopsis mali* n. sp., is given.

Apple rust controllable by spraying, E. T. BARTHOLOMEW (*Phytopathology, 2 (1912), No. 6, pp. 253–257*).—The author states that apple rust has become especially destructive in Wisconsin during the past three years, and an attempt was made during the spring of 1912 to control the disease by spraying. The variety Wealthy, being one of the most susceptible, was taken for the experiment, and the spraying was done in three different orchards. One of the orchards was located directly at the base of a bluff covered with cedars, while the others were from a quarter to a half mile from the same bluff. Close watch was kept on weather conditions and the maturing of the cedar galls, and it was found that the crucial time for the application of the fungicide depends entirely upon such weather conditions as favor the development of the cedar galls.

The results of the spraying were quite satisfactory in showing that by spraying at the proper time, which is within a few hours after the sporidia are formed on the cedar galls, the disease can be controlled to a very considerable extent.

Control of apple rust by spraying, N. J. GIDDINGS and D. C. NEAL (*Phytopathology, 2 (1912), No. 6, pp. 258–260, pls. 2*).—A preliminary report is given of spraying experiments with Bordeaux mixture, lime-sulphur mixture, and atomic sulphur for the control of apple rust. These were applied to different portions of the trees and the effect noted.

It was found that the sprayed portions of the trees treated May 4 and 6 were especially free from rust, the portion sprayed with Bordeaux mixture being apparently the healthiest in each case. A count of apples from an unsprayed tree showed an average of 85 per cent of the fruit rusted, while there was practically no rusted fruit on the sprayed portions of the tree treated May 6.

The authors conclude that apple rust may be controlled by the spray mixtures in common use, provided the application is made at the right time. The three factors to be considered when spraying for this disease are the condition of the cedar apples, the condition of the apple foliage, and the weather. These three factors are said to be more closely related in apple-rust infection than is the case with any other apple disease.

Important diseases of small fruits in the Pacific Northwest, H. S. JACKSON (*Better Fruit, 7 (1912), No. 6, pp. 19–22, 45–48, figs. 8*).—This is a brief discussion of the nature, cause, and control by curative or preventive treatment, so far as known, of anthracnose of the raspberry, blackberry, loganberry, currant, etc.; crown gall of the loganberry, blackberry, grape, etc.; mushroom root rot of apples and prunes; raspberry cane blight; powdery mildew of the grape, gooseberry, etc.; and leaf spot of the strawberry.

An experiment on the control of currant cane necrosis by summer pruning, F. C. STEWART (*New York State Sta. Bul. 357, pp. 10*).—Attention is called to the injury caused to currants by the fungus *Botryosphæria ribis* (E. S. R., 25, p. 848). From the behavior of the disease it was believed that it could be controlled by the systematic pruning of diseased canes during the spring and summer. The present bulletin gives an account of an experiment in which pruning of old canes was tested, and also of an experiment, which was run for 6 years, in pruning newly set canes.

It was soon seen that pruning the old canes was without effect, and the experiment in pruning the young canes was continued, the plants being summer pruned from two to six times during the year. The pruning was without effect

in controlling the disease, and for the present there is no line of treatment known that can be definitely recommended for its control.

Pruning fails to control a currant disease, F. H. HALL (*New York State Sta. Bul. 357, popular ed., folio*).—A popular edition of the above.

The after effects of cold on grapevines in regard to arricciamento, L. PETRI (*Coltivatore, 58 (1912), No. 35, pp. 568–575, figs. 3*).—This is mainly a brief discussion of the author's previous work on arricciamento or roncet (E. S. R., 28, p. 550), and of the importance of weather and possibly of foreign stock in the disease, with illustrations showing the visible internal and external changes in parts affected.

The occurrence of downy mildew, G. MOUNEYRÈS (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 49, pp. 717–730*).—This is a critical review of a series of communications from G. Barbut (E. S. R., 28, p. 448), presenting also the author's own views on this subject. See also a previous note (E. S. R., 28, p. 244).

Spore germination and infection with Plasmopara viticola, C. T. GREGORY (*Phytopathology, 2 (1912), No. 6, pp. 235–249, figs. 7*).—A study made of the oospores and other fruiting bodies of *P. viticola* has shown that by the germination of the oospores conidia are formed and on their germination swarm spores are developed. These develop appressoria, through which infection of the grape takes place.

Experiments on the infection of the grape were carried on from which it was found that all the infections where the conidia were placed on the upper surface of the leaves failed, while a considerable proportion of those placed on the lower surface of the leaves developed the characteristic disease. The author agrees with Müller-Thurgau (E. S. R., 26, p. 450) that infection of the grape occurs only through the stomata of the lower surface of the leaves and that the penetration of the epidermis, though it may be possible, does not commonly occur. In explanation of the observations of Ravaz and Verge (E. S. R., 26, p. 550), the author suggests that the conidia may fall on the upper surface, where they germinate, and the swarm spores may then swim over the edge of the leaf to the lower surface.

Injury to grapevines by Valsa vitis, H. C. SCHELLENBERG (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 586–594, pl. 1*).—The author claims to have shown that infection of grapevines by *V. vitis* causes the punctiform black spots, and that bacteria are a result and not a cause of this disease; also that *V. vitis* is found on some American grapevines.

A new fungus concerned in withertip of varieties of Citrus medica, R. E. CLAUSEN (*Phytopathology, 2 (1912), No. 6, pp. 217–234, pls. 2, fig. 1*).—The author reports the occurrence in California of a disease resembling that known as withertip in Florida, and upon examination he found *Colletotrichum glœosporioides* abundant in connection with the disease. Investigations, however, showed that artificial infections with this fungus would not produce the disease. This led to a further study, with the result that it was determined that two fungi are concerned with withertip troubles.

Extensive inoculation experiments were carried on and culture studies made of the organism which is believed to be the important cause of the disease. Not only the cultural but the morphological characters revealed differences between this fungus and that usually considered as causing the disease, and a new species, *Glœosporium limetticolum*, is described.

From the artificial infection work this fungus was found to attack only forms and varieties of *Citrus medica*. It is absolutely distinct from *C. glœosporioides*, and from this study it is believed that a reasonable explanation is offered for

the differences of opinion of various investigators regarding the nature of the withertip of species of citrus.

The Sporotrichum bud rot of pinks in Germany, E. Molz and O. Morgenthaler (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 654–662, pl. 1, fig. 1*).—It is stated that investigations made point to the conclusion that *S. poae*, said to cause a bud rot of pinks, may be carried by the visits of *Pediculopsis graminum*, which is found in the pink buds.

As remedial or preventive measures the author recommends destruction of all infected buds and the ventilation of hothouses. Too high moisture content of air and soil should be avoided, likewise the use of swamp soil in pink culture, as this is often infected with conidia from this fungus on swamp grasses.

A new disease of sweet peas (Lathyrus odoratus), O. Oberstein (*Ztschr. Pflanzenkrank., 22 (1912), No. 8, pp. 463, 464, figs. 2*).—A cauliflower like bunch, caused by stunted growth of stem and leaf organs at the base of a sweet pea, is noted, suggesting the work of *Tylenchus dipsaci*. Microscopic investigation failed to show the presence of this or any other agent capable of causing the malformation.

Endothia virginiana, P. J. and H. W. Anderson (*Phytopathology, 2 (1912), No. 6, pp. 261, 262*).—A technical description is given of *E. virginiana* n. sp., the fungus mentioned in a previous report as being a form of that causing the chestnut blight, but which so far has proved only weakly parasitic (E. S. R., 28, p. 551). In addition, the authors, agreeing with others that the fungus should be transferred from the genus Diaporthe to Endothia, propose the name *E. parasitica* for the name of the true chestnut-blight organism.

Chestnut-blight fungus and its allies, G. P. Clinton (*Phytopathology, 2 (1912), No. 6, pp. 265–269*).—This paper is essentially the same as that noted elsewhere (E. S. R., 28, p. 651).

Studies on the diseases of Norrland pine trees, especially with reference to reforestation, T. Lagerberg (*Skogsvårdsför. Tidskr., Fackafd., 1912, No. 5, pp. 291–326, figs. 24*).—Diseases due to the following fungi and insects are described and discussed: *Dasyscypha fuscosanguinea*, *Crumenula pinicola*, *Lachnellula chrysophthalma*, *Phacidium infestans*, *Cenangium abietis*, *Peridermium pini*, *Pissodes notatus*, and *Magdalis violacea*. A bibliography of the subject is appended.

The so-called Septoria disease of Norway spruce, Rudolph (*Naturw. Ztschr. Forst u. Landw., 10 (1912), No. 8, pp. 411–415, fig. 1*).—The author, studying the disease of *Picea excelsa* ascribed to *Septoria parasitica*, claims to have succeeded in separating the fungus material into four forms, considered to be, respectively, *S. parasitica*, *Scleropycnis abietina*, *Cytospora* sp. (possibly *C. abietis*), and spores of a fungus thought to be a species of Phoma. Experiments to test the ability of the spores found to produce the characteristic disease symptoms were without results.

Aerial isolation and inoculation with Pythium debaryanum, J. V. Hofmann (*Phytopathology, 2 (1912), No. 6, p. 273*).—The author reports on inoculation experiments with *P. debaryanum* obtained by isolating exposed plates at a height of 30 ft. above the ground. The inoculations were made on *Picea canadensis* and *Pinus ponderosa*, and in each case a considerable percentage of the inoculations resulted in disease. Inoculations were made with cultures of the organism obtained from other sources, such as cabbage plants, radish, and *Salsola tragus*, upon the same species of conifers mentioned above, with the result that in every instance some of the inoculations proved effective. No infection occurred except at points of inoculation.

Dry-rot investigations.—V, The dry-rot problem from a legal standpoint, K. Dickel (*Hausschwammforschungen, V. Jena, 1911, pp. 70*).—Besides legal

history and other material bearing upon dry rot, the author gives a brief account of recent decisions regarding *Polyporus vaporarius* and *Merulius lacrymans*, as to the differences in appearance, dispersion, life conditions, etc., of the two fungi. See also a previous note (E. S. R., 26, p. 544.)

Dry-rot investigations.—VI, The Merulius rot of structural wood, R. FALCK (*Hausschwammforschungen, VI. Jena, 1912, pp. XVI+405, pls. 17, figs. 73; abs. in Mycol. Centbl., 2 (1913), No. 4, pp. 214–220*).—This work, in continuation of dry-rot studies (see above), is in three parts. The first is a monograph based on cultural studies and deals with the morphology and anatomy of the *Merulius lacrymans* group (here separated into *M. domesticus*, *M. sylvester*, and *M. minor*) and of *M. sclerotiorum* (which is said to be sufficiently distinct to be placed in a separate genus) in connection with Coniophora, Paxillus, and Vaporarius. The second discusses the distribution and maintenance of the dry-rot fungus and its production from spores. The third deals with the control of dry rot through immunization of structural wood by the use of chemical substances.

It is said that while complete dryness tends to destroy the life of the fungus, dampness in air or wood favors the spread of the mycelium. Extension from house to house was rarely observed. Germination and development of spores were favored by moisture and by the hydrogen ion of acids, acetic and nitric acids excepted. An optimum degree of concentration can be found, also a point at which germination is hindered. In case of strong acids this point is reached at low concentration. Spores are carried mainly by air currents. Germination of the spores of Merulius is favored by the presence and products of some other fungi, as Coniophora. A definite water content favors their germination on wood. It is said that about 50 per cent of house rot is due to this fungus, which attacks wood otherwise immune for centuries.

The principal method of protection is immunization of the wood. This is favored by (1) keeping it free from other fungi, (2) avoidance of moisture, and (3) covering the surface with paint or a disinfectant which will reach all parts accessible to the spores.

Pigment formation by Merulius lacrymans, C. WEHMER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 6, pp. 321–329, figs. 3*).—This is a discussion by the author of his studies on *M. lacrymans* in regard to its formation of pigments, and in connection therewith a brief reference to *M. silvester* (see below).

Merulius lacrymans and M. silvester, C. WEHMER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 601–604*).—A comparative study of *M. lacrymans*, the cause of dry rot in houses, with that said to cause wild dry rot, led the author to the conclusion that the latter, designated as *M. silvester*, is to be regarded as a distinct species.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Useful birds of Porto Rico (*Porto Rico Prog., 4 (1913), No. 13, pp. 13, 14*).—It is stated that during the economic investigations of birds in Porto Rico by the Biological Survey of this Department several species of herons were found to be valuable to agriculture in destroying large numbers of "La Changa" or mole cricket. This is especially true in the case of the green heron and to a less extent of the little blue heron and snowy heron. With a view to protecting the heron, it has been recommended that certain areas of mangrove swamps under insular control, which the herons frequent for resting places and for the purpose of breeding, be designated as bird refuges.

[Report on propagation of birds], A. MERRILL (*Rpt. Comrs. Fisheries and Game [Mass.], 1911, pp 45–59, pls. 13*).—This is a detailed report upon the

propagation of pheasants, quail, and European or gray partridges at the Sutton hatchery for the year ended December 31, 1911.

The destruction of animal and vegetable pests, L. FRANÇOIS and H. ROUSSET (*Destruction des Parasites. Paris, 1913, pp. XII+320*).—This book deals with both insect and other animal pests, fungus diseases, etc.

The bearing of physiology on economic entomology, J. DEWITZ (*Bul. Ent. Research, 3 (1912), No. 4, pp. 343–354*).—In this paper the author discusses the tropisms, the influence of external and internal factors on the development and life of insects, and the physiological effects of insecticides.

A bibliography of 36 titles is appended.

The effect of heat on insect larvæ, J. DEWITZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 33 (1912), No. 52, pp. 808–816*).—The author finds that a temperature from 40 to 45° C. is fatal to caterpillars of the eudemis and cochylis moths and of *Phalera bucephala*, and of the blowfly larvæ (*Calliphora erythrocephala*).

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1911, pp. 403–501, pls. 3, figs. 5*).—The first part of this report consists of notes on the more important insects of the year, the pests discussed including the gipsy and brown-tail moths, cutworms, strawberry weevil, asparagus beetles, harlequin cabbage bug, plant lice, the garden webworm (*Eurycreon rantalis*), blister beetles, bramble flea louse (*Trioza tripunctata*), apple leafhopper, apple bud moth, the common plant bugs, the false apple red bug (*Lygidea mendax*), pear midge, pear psylla, maple pseudococcus or false scale, oyster-shell scale, San José scale, a clover weevil (*Phytonomus melus*), the poplar-leaf beetle, *Vanessa antiopa*, the cotton moth, a European hornet (*Vespa crabro*) which now occurs in New Jersey, elm-leaf beetle, peach borer, cranberry insects (vine worms, cutworms, girdle worms, tip worm), May beetles, rose chafer, etc.

A paper prepared chiefly by E. L. Dickerson on the spinach or beet-leaf maggot (*Pegomyia vicina*) follows. Observations made of the maggots show the normal depth of pupation to be within 2 in. of the surface. In New Jersey the flies apparently do not begin to emerge until late April and continue ovipositing well through May. Two species of parasites were reared, one a new species of Apanteles, the other *Opius anthomyiæ*. Injury by this pest is principally to spinach, due to its use for greens, but beets are badly infested and their growth retarded. The most important remedial measure consists in the destruction of food plants, particularly lamb's-quarters, a common and widely distributed weed which occurs plentifully in many places.

Observations of the occurrence of the periodical cicada in the State, next reported, are followed by an account of the plum curculio, its internal and external anatomy, hibernating records, and tabulated data relating to the effect of sprays upon its infestation of peaches.

Plant pests and diseases, W. NOWELL (*Rpt. Local Dept. Agr. Barbados, 1911–12, pp. 46–52; abs. in Agr. News [Barbados], 12 (1913), No. 282, pp. 58, 59*).—A scale insect new to the West Indies, *Pseudaonidia (Aspidiotus) trilobitiformis*, previously recorded from Brazil, is reported to have been discovered on cacao plants from St. Lucia. The author also discusses the fungi parasitic on scale insects, occurrence of the cotton-leaf blister mite, an account of which has been previously noted (E. S. R., 27, p. 60), and a field investigation of beetle larvæ attacking the roots of sugar cane, namely, *Diaprepes abbreviatus*, *Sphenophorus sericeus*, and *Phytalus smithi*. A scoliid, *Tiphia parallela*, is said to parasitize *P. smithi*.

A note on insect pests in the Virgin Islands, H. A. TEMPANY (*Agr. News [Barbados], 12 (1913), No. 281, pp. 42, 43*).—This note relates to several of the more important insect pests observed during the author's recent visit.

A further note on some Casuarina insect pests of Madras, V. SUBRAMANIA IYER ([*Indian*] *Forest Bul. 11, 1912, pp. 9, pls. 4*).—This paper gives descriptive accounts of insect pests of the Casuarina in the various stages of its growth, among which are mentioned *Brachytrupes achatinus*, which attacks the young seedlings in the nursery; the Casuarina bark-eating caterpillar (*Arbela tetraonis*), which is both a bark and wood borer and the source of much damage; and the cerambycid beetle *Cœlosterna scabrata*, the larvæ of which bores into the wood of the roots of the trees.

The insect parasites of domestic animals in Argentina, K. WOLFFHÜGEL (*Rev. Med. Vet. Montevideo, 3 (1912), No. 1, pp. 25–30*).—This paper, which is supplementary to that previously noted (E. S. R., 26, p. 780), deals with the Sarcopsyllidæ. The parasites considered are *Dermatophilus penetrans* and *Hectopsylla psittaci*.

Experiments on insect transmission of the virus of poliomyelitis, C. W. HOWARD and P. F. CLARK (*Jour. Expt. Med., 16 (1912), No. 6, pp. 850–859*).—The conclusions drawn from the investigations here reported are as follows:

"The domestic fly (*Musca domestica*) can carry the virus of poliomyelitis in an active state for several days upon the surface of the body and for several hours within the gastro-intestinal tract. Mosquitoes (*Culex pipiens, C. sollicitans*, and *C. cantator*) in our experiments have not taken up and maintained in a living state the virus from the spinal cord of monkeys. Lice (*Pediculus capitis* and *P. vestimenti*) have not taken the virus out of the blood of monkeys or maintained it in a living state. The bedbug (*Cimex lectularius*) has taken the virus with the blood from infected monkeys and maintained it in a living state within the body for a period of 7 days."

Miscellaneous entomogenous fungi (*Agr. News* [*Barbados*], *12 (1913), No. 283, p. 78*).—This is a brief review of recent literature.

White ants in Natal: Their nature and treatment, C. FULLER (*Agr. Jour. Union So. Africa, 4 (1912), Nos. 3, pp. 345–369, figs. 16; 4, pp. 543–571, figs. 15*).—A summarized account.

The locust pest, C. R. JONES and D. B. MACKIE (*Philippine Agr. Rev.* [*English Ed.*], *6 (1913), No. 1, pp. 5–22, pls. 4, figs. 5*).—This is a discussion of the migratory locusts in the Philippines, the injury they cause, and the approved methods of dealing with them.

The locust (*Defensa Agr.* [*Uruguay*] *Pub. 2, 1912, pp. 39, figs. 14*).—This publication deals with the migratory locust (*Schistocerca paranensis*) in South America and the methods employed in combating it.

On some new species of leafhoppers, G. W. KIRKALDY and F. MUIR (*Hawaiian Sugar Planters' Sta., Ent. Bul. 12, pp. 92, figs. 54*).—This bulletin consists of 2 parts. The first part (pp. 7–27) contains descriptions of various new species of Cicadidæ, Cercopidæ, and Fulgoridæ (Ricaniinæ, Flatinæ, and Issinæ) taken from manuscript notes of the late G. W. Kirkaldy. The second part (pp. 28–91), by F. Muir, deals with the Derbidæ, their habits and classification, with descriptions of numerous new genera and species collected in Fiji and the Malay Archipelago, including tables for their separation.

Report of a trip to India and the Orient in search of the natural enemies of the citrus white fly, R. S. WOGLUM (*U. S. Dept. Agr., Bur. Ent. Bul. 120, pp. 58, pls. 12, figs. 2*).—The first part of this bulletin consists of a general account of the citrus white fly in this country, its life history, distribution, and injury, based largely upon a bulletin by Morrill and Back, previously noted (E. S. R., 25, p. 659). Then follow accounts of the preparation for the search and investigations in Europe, Ceylon, India, Burma, Java, southern China, and the Philippine Islands. The author discusses the work carried on at Lahore

with *Prospaltella lahorensis*, the true internal parasite of the citrus white fly discovered at that place, with the citrus white fly, and with the coccinellid *Cryptognatha flavescens*, the important predatory enemy of the citrus white fly, in northern India, accounts of which have been previously noted (E. S. R., 27, p. 860).

In order to transport the parasite and predator it was found necessary to infest young orange trees with the citrus white fly, the infested trees being then shipped in Wardian cases. Upon arriving at the government laboratory at Orlando, Fla., on December 2, 28 lady beetles and 8 adult parasites were found to be active and healthy. The white fly in Florida being in a dormant condition at that time an attempt was made to carry the imported insects through the winter in a state of hibernation, but none of the parasites or the lady beetles survived.

In appendixes the author gives an account of citrus fruits in India, enumerates insect pests of citrus trees seen by him during his investigations in various foreign countries, and presents observations on the Coccidæ and their natural enemies in Spain, Italy, Sicily, and India, Coccinellidæ introduced from India and fumigation of citrus trees in Spain.

Papers on Coccidæ or scale insects.—The genus Fiorinia in the United States, E. R. Sasscer (*U. S. Dept. Agr., Bur. Ent. Bul. 16, pt. 5, tech. ser., pp. 75–82, pls. 4*).—At the time of writing the genus Fiorinia consisted of 30 described species and 4 varieties, of which 2 species and 1 variety are said to be established in this country, namely, *Fiorinia fioriniæ*, *F. theæ*, and *F. fioriniæ japonica*. The available records indicate that the first 2 were imported on ornamental plants; the third was accidentally introduced from Japan, and is not infrequently collected at quarantine on imported evergreens.

In the United States the tea scale (*F. theæ*) has been recorded on camellias in Alabama, District of Columbia, Florida, Georgia, Louisiana, North Carolina, and South Carolina. Although it seems to show preference for tea at Summerville, S. C., it appears to be quite a serious pest on the camellias in several of the more southern States, and is not infrequently found associated with *Lepidosaphes lasianthi*. The predaceous beetles *Chilocorus bivulnerus*, *Microweisea misella*, and *Cybocephalus nigritulus* have been observed preying on the tea scale in South Carolina.

F. fioriniæ is a very cosmopolitan species, being of common occurrence on kentias in greenhouses. It has been recorded in the United States from Alabama, California, Colorado, District of Columbia, Louisiana, Maryland, Massachusetts, and Hawaiian Islands. Its natural enemies include the parasites *Aspidiotiphagus citrinus*, *Chœmerops humuli*, and *Prospaltella aurantii*. *F. fioriniæ japonica* appears to have become established in New York.

Papers on Coccidæ or scale insects.—Catalogue of recently described Coccidæ, IV, E. R. Sasscer (*U. S. Dept. Agr., Bur. Ent. Bul. 16, pt. 6, tech. ser., pp. 83–97*).—This fourth part of the author's catalogue (E. S. R., 25, p. 463) lists 6 new genera, 110 new species, and 4 new varieties of Coccidæ, descriptions of which appeared prior to March, 1912.

Papers on Coccidæ or scale insects.—An index to catalogues of recently described Coccidæ included in technical series Nos. 12 and 16. E. R. Sasscer (*U. S. Dept. Agr., Bur. Ent. Bul. 16, pt. 7, tech. ser., pp. 99–116*).—This is an index to the genera and species of scale insects catalogued in Technical Bulletins 12 and 16, previously noted (see above). It is intended to be a complete index to all the forms described and published since the issue of Mrs. Fernald's Catalogue of Coccidæ in 1903 (E. S. R., 15, p. 278).

Papers on deciduous fruit insects and insecticides.—The fruit-tree leaf-roller (Archips argyrospila), J. B. Gill (*U. S. Dept. Agr., Bur. Ent. Bul. 116*

pt. 5, pp. 91–110, pls. 5).—The fruit-tree leaf-roller has become unusually abundant during the past few years and has caused considerable loss to fruit growers in certain sections, notably in Colorado and New Mexico, and in New York State. Accounts of this insect by Stedman and Herrick have been previously noted (E. S. R., 18, p. 1145; 27, p. 160).

In this paper the author reports investigations commenced in 1911 and conducted largely at Canon City, Colo., and Espanola, N. Mex. At the former place the damage has been large, as the insect has appeared in serious numbers in about 7,500 acres of bearing orchards, and is also spreading rapidly into adjacent fruit districts. At Espanola, N. Mex., a comparatively small fruit belt, the infestation has not been so serious, although the damage "has varied from 25 to 90 per cent of the entire fruit crop, depending on the measures of control adopted, the abundance of the 'worms,' and the kind or variety of fruit attacked. In unsprayed orchards the writer has seen the entire fruit crop ruined by the larvæ, and the trees completely defoliated so that not a green leaf could be noticed."

The author deals with the subject under the headings of the history, distribution, food plants, character of injury, description of stages, life history and habits, natural enemies, and methods of control. His life history studies of the insect are summarized as follows: "The larval stage in the material under observation varied from 24 to 35 days, the average being 28.05 days; the pupal stage from 9 to 15 days, the average being 11.25 days; and the adult or moth stage from 2 to 3 days for the males and 3 to 4 days for the females. The life of the moths is probably longer than this under normal conditions. Females were depositing eggs between 2 and 3 days after emergence. In the field (under Colorado conditions) the period of egg laying extended from about the second week in June to the middle of July, the maximum being reached from June 25 to July 10. The eggs remain on the trees unhatched until the following spring. Hence this insect has only 1 generation in the course of a year. The hatching of the eggs in the spring may extend over a period of many days, depending on the weather. The time of hatching of the eggs will vary greatly with the different seasons and in different sections of the country. Generally speaking, it may be stated that the eggs will begin hatching about the time the cluster buds of early-blooming varieties of apples are beginning to show, but before they have fully separated."

The natural enemies of this pest include 8 species of birds; 8 species of parasites (*Pimpla pedalis, Itoplectis conquisitor, Epiurus indigator, Meteorus archipsidis, Exorista nigripalpis, E. pyste, E. blanda*, and *E. cheloniæ*); 3 predaceous insects (*Calosoma scrutator, Notoxus monodon*, and *Formica montanus*); and a small mite (*Erythræus* sp.).

Applications of arsenicals alone and in combination with 40 per cent nicotin solution have greatly reduced the amount of injury to the fruit and foliage, but these sprays have not been so effective as is desirable. Miscible oils when used at the strength commonly employed against the San Jose scale, namely, 1 gal. to 15 gal. of water, will prevent most of the eggs from hatching, from 93.23 to 96.21 per cent of the egg masses having been destroyed on the experimental plats. Good results were also obtained by the use of kerosene and crude-petroleum emulsions, although these substances were, on the whole, not quite equal to the miscible oils. Lime-sulphur at strengths ranging from 1 gal. of lime-sulphur to 7 gal. of water to 1 gal. of lime-sulphur to 10 gal. of water was ineffective.

Upon the polyhedral body disease of the nonne (Lymantria monacha), B. WAHL (*Centbl. Gesam. Forstw., 35 (1909), Nos. 4, pp. 164–172, figs. 2; 5, pp.*

212–215; 36 (1910), No. 8–9, pp. 377–397; 37 (1911), No. 6, pp. 247–268; 38 (1912), No. 8–9, pp. 355–378).—This series of articles records the author's investigations on the nun moth commenced in 1908 and continued up to and including the year 1911.

Report on the mosquito work for 1911, J. B. SMITH (*New Jersey Stas. Rpt. 1911, pp. 505–582, pls. 5*).—This is a detailed report of the work carried on in 1911 in various parts of the State.

An investigation of the incidence of the micro-organisms known as non-lactose fermenters in flies in normal surroundings and in surroundings associated with epidemic diarrhea, G. S. GRAHAM-SMITH (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], Sup. Rpt. Med. Officer, 41 (1911–12), pp. 304–320*).—"Many varieties of bacilli which do not ferment lactose or liquefy gelatin are found in flies. A greater proportion of flies is infected with these organisms during August and the early part of September than at other times. Only one, the Morgan or Ga group, of the groups into which these bacilli can be divided, occurs frequently in flies from diarrhea-infected houses and rarely in flies from nondiarrhea-infected houses. From the results of previous experiments it is certain that flies infected with Morgan's bacillus can contaminate materials on which they feed or over which they walk. Over one-third of all the flies examined were found infected with lactose-fermenting bacilli of the colon type."

An investigation into the possibility of pathogenic micro-organisms being taken up by the larva and subsequently distributed by the fly, G. S. GRAHAM-SMITH (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], Sup. Rpt. Med. Officer, 41 (1911–12), pp. 330–335*).—The author finds that (1) blowflies which develop from larvæ allowed to feed on the bodies of animals dead of infection due to *Bacillus enteritidis* or *B. anthracis* are not infected with these organisms; (2) a large proportion of the house flies (*Musca domestica*) which develop from larvæ infected with the spores of *B. anthracis* are infected; and (3) of non-spore-producing organisms only those which are adapted to the conditions prevailing in the intestine of the larva, such as Morgan's bacillus and certain nonlactose fermenting bacilli, survive through the metamorphosis and are present in the flies. Organisms such as *B. typhosus*, *B. enteritidis*, and *B. prodigiosus* rarely survive.

Transmission of disease by native blood-sucking insects, A. SCHUBERG and P. KUHN (*Arb. K. Gsndhtsamt., 40 (1912), No. 2, pp. 209–234*).—This second part of the paper previously noted (E. S. R., 26, p. 150) deals with the transmission of spirochetes by *Stomoxys calcitrans* at different periods after having sucked the blood of a diseased animal, and the transmission of African horse sickness, chicken pox, and of anthrax by *S. calcitrans*. A bibliography of 43 titles is appended.

Collected notes on the insect transmission of surra in carabaos, M. B. MITZMAIN (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 12, pp. 670–681*).—These notes deal with the dispersal of carabao lice and their rôle in the transmission of *Trypanosoma evansi*, an experiment to demonstrate periods of non-infectivity in carabaos affected with surra, an entomological study of a surra outbreak among carabaos in the region of La Carlota, Occidental Negros, and the relation of *Lyperosia* sp. flies to surra in carabaos.

"The carabao louse (*Hæmatopinus bituberculatus*) is shown to be an agent in the transmission of surra from infected to healthy carabaos. The parasites failed to transmit the infection in periods of 48 hours, 24 hours, and 12 hours after removal from the infected host, but proved infectious when applied to a healthy carabao 2 hours after feeding on the infected host. No evidence is obtained to show that the transmission is cyclic, but it is more probably purely mechanical. Lice removed from infected carabao failed to reproduce the dis-

ease in guinea pigs and monkeys. A species of Lyperosia is found in this locality to be a means of dispersal for the carabao louse. . . .

"During the negative stage of the disease the carabao is not a source of danger as an active focus for fly dissemination. It does not become imperative to verify microscopical findings (when carefully performed) by animal inoculation in suspected cases of surra in carabaos; it is not convincing nor significant during negative periods. When the trypanosome is not found during protracted stages upon microscopical examination it should not be assumed that the carabao is free from infection."

Report on rat fleas in Suffolk and North Essex, C. STRICKLAND and G. MERRIMAN (*Ann. Rpt. Local Govt. Bd. [Gt. Brit.], Sup. Rpt. Med. Officer, 41 1911–12), pp. 336–348, pls. 2, fig. 1*).—The principal observations made during investigations of 3,293 rat fleas taken from 822 rats in the suspected plague area of East Suffolk from July to October, 1911, have been summarized as follows:

The average number of fleas per rat was subject to a local variation (0.6 to 6.5). Fifteen species of fleas were taken, but only *Ceratophyllus fasciatus* and *Ctenophthalmus agyrtes*, occurred in any numbers, 1,986 being *C. fasciatus*, 1,257 being *C. agyrtes*, and 50 being rare species. The average number of fleas per rat and the percentage of rats infested by fleas showed a well-marked seasonal variation, there being a considerable decline in the numbers as the cooler weather came on. *C. fasciatus* was chiefly found on rats caught near human habitations, *C. agyrtes* on those caught in the hedgerows.

Grass grubs. The small green cockchafer: Some notes on its life history, A. H. COCKAYNE (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 6, pp. 579–585, figs. 5*).—It is stated that the monetary damage caused by white grubs is very extensive, far exceeding that by other insects in New Zealand. It has been found that a great deal of the damage that has previously been attributed to *Odontria zealandica* is caused by the common green cockchafer, *Pyronota festiva*.

May beetles or "Caculos," C. W. HOOKER (*Porto Rico Prog., 4 (1913), No. 8, p. 14*).—It is stated that the Japanese fungus *Metarrhizium anisoploe*, which was introduced by the Federal Experiment Station, has been recovered from districts at some distance from the points at which it was planted, and that it appears to be spreading as rapidly as can be expected.

The sombre twig pruner (Thercladodes kraussi), C. FULLER (*Agr. Jour. Union So. Africa, 5 (1913), No. 2, pp. 263–288, figs. 13*).—This is a detailed report of life history studies, natural enemies, and remedial measures for *T. kraussi*, an enemy of privet, ash, olives, and jasmine in Natal.

The coccinellids of Piedmont useful to agriculture, G. DELLA BEFFA (*Abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 1912), No. 9, p. 2104*).—The author lists 64 beneficial species of lady beetles which occur in Piedmont, Italy.

The movement of the cotton-boll weevil in 1912, W. D. HUNTER and W. D. PIERCE (*U. S. Dept. Agr., Bur. Ent. Circ. 167, p. 3, fig. 1*).—The authors point out that despite the checks received by the very unusual climatic conditions of the winter of 1911–12 the boll weevil made a net gain of 7,300 square miles in 1912.

A map is given which shows the extent of the infested territory in 1912 and in various preceding seasons. Three points that are especially noteworthy in connection with the map are: (1) The failure of the insect to extend into central Oklahoma as far as it did in 1906; (2) the comparatively small loss of territory along the northern border in Arkansas and Mississippi; and (3) the fact that the weevil was able to maintain itself practically to the western limit of the area of continuous cotton culture in the central part of Texas.

A preliminary list of ants from Illinois, M. C. TANQUARY (*Trans. Ill. Acad. Sci., 4 (1911), pp. 137-142*).—This is an annotated list of the species known to occur in the State.

The Bombidæ of the New World, Part I, H. J. FRANKLIN (*Trans. Amer. Ent. Soc., 38 (1912), Nos. 3–4, pp. 177–486+III*).—The present paper represents the first part of a monograph which is based upon the examination and study of about 15,000 North American and 1,000 South American specimens. Following a brief introduction and history of the Bombidæ, the paper takes up the family Bombidæ, its synonymy and characters, and gives tables for the separation of the genera Bombus and Psithyrus. The author concludes that these 2 genera must be looked upon as being 2 comparatively closely related genera of the family Bombidæ and that they should not be given separate subfamily rank. Those who have placed them either in separate families or in separate subfamilies have evidently been led to do so by the general differences in habit rather than by structural differences.

Under the genus Bombus next taken up the author gives a synonymic list; discusses their geographical distribution, with a table showing the number of species, genera, groups, species, and political divisions of North America; climatic variation; economic importance; external anatomy; species and subspecies limits; arrangement of specific descriptions; etc.

Detailed descriptions of the species of Bombus and Psithyrus occurring north of Mexico take up the remainder of this part. Tables are given for the separation of queens, workers, and males of Bombus. Under the subgenus Bombus 38 species are considered, which are placed under the groups Terrestries, Borealis, Kirbyellus, Pratorum, and Dumoucheli. One species, namely, *Bombus (Bombus) bolsteri* from Newfoundland is here described as new to science.

Under the subgenus Bombias 9 species, arranged under the groups Auricomus and Fraternus are recognized, of which 1, namely, *Bombus (Bombias) henshawi* from California, is described as new to science.

A brief account is next given of the genus Psithyrus, including a synonymic list, tables for the separation of both males and females of the North American species, etc. The genus is represented by 11 species arranged under the groups Laboriosus, Ashtoni, and Fernaldæ, 2 species, namely, *Psithyrus bicolor* from New Mexico and *P. crawfordi* from California and Oregon, being described as new to science.

Report of the assistant entomologist, E. C. COTTON (*Tennessee Sta. Rpt. 1910, pp. 112, 113*).—This report consists largely of a statement of the work carried on with the cattle tick (*Margaropus annulatus*) in order to determine the effect of various climatic conditions. A number of fully engorged females were confined in grass plats and allowed to deposit their eggs under normal conditions. In spite of the large number of eggs (10,000 to 12,000) in each of these plats and the favorable conditions under which they were placed seed ticks were found in but one plat. The eggs in the other plats were destroyed by Thysanura and Collembola, which swarmed on the damp ground under the grass. The tests thus indicate a considerable destruction of tick eggs deposited on grassland under natural conditions, especially if they are laid during the cooler portions of the year.

Investigations commenced in 1909 to determine the pathogenicity of *Amblyomma americana*, *A. cajennense*, and *Dermacentor variabilis* gave negative results so far as the transmission of splenetic fever to cattle is concerned. Other attempts to produce splenetic fever in nonimmune cattle with larvæ of the cattle tick showed that a very large number of seed ticks is necessary to cause a typical case of the fever, especially during the cooler part of the year. It is

stated that some time was spent in a study of the internal anatomy of the replete and spent female ticks.

Ticks and how to destroy them, M. R. Powers (*South Carolina Sta. Circ. 6, pp. 18, figs. 4*).—A popular account of the methods employed in combating ticks.

Flour paste as a control for red spiders and as a spreader for contact insecticides, W. B. Parker (*U. S. Dept. Agr., Bur. Ent. Circ. 166, pp. 5, figs. 2*).—The author's experiments show that flour paste greatly increases the efficiency of lime-sulphur spray as an arachnicide when used at the rate of 4 gal. of paste (4 lbs. of flour) to 100 gal. of spray, 99 per cent of the red spiders on hops having been destroyed against 37.5 per cent when used without the starch. The greatly increased efficiency was found to be mainly due to the spreading effect of the paste. In experiments with the hop aphis (*Phorodon humuli*) it was found that flour paste was a very effective spreader for nicotin sulphate. In spraying experiments with flour paste alone, 8 lbs. to 100 gal. of water and 16 lbs. to 100 gal. of water were effective against *Tetranychus bimaculatus*, but had no effect on the eggs, and in controlling the mites a second application 7 to 10 days later was necessary to catch the mites that emerge from the eggs. The 8:100 solution of paste was effective against some very delicate species of aphids and the younger stages of the hop aphis, but was not effective against the stouter aphids.

In summarizing the author states that flour paste has proved effective when applied to red spiders upon beans, chrysanthemums, hops, cucumbers in the greenhouse and field, pumpkins, pears, prunes, roses in the field, and violets in the field and greenhouse, but was not satisfactory when used for the red spider on greenhouse roses, greenhouse carnations, or field sweet peas. Directions are given for its preparation.

On the fourth molt of nematode parasites, L. G. Seurat (*Compt. Rend. Soc. Biol.* [*Paris*], *73 (1912), No. 28, pp. 279–281, figs. 2; abs. in Jour. Roy. Micros. Soc. 1912, No. 6, p. 615*).—The author has found that *Spiroptera sanguinolenta* reaches the interior of its definitive host, the dog, as an encapsulated larva which has molted twice. Being liberated in the dog's stomach, it passes through the walls into the blood stream and causes tumors in the walls of the aorta in which it grows, molts for the third time, and passes into the fourth stage, which immediately precedes the adult stage and is marked by vigorous growth and the development of the gonads. Experimental infestations of the dog and hedgehog have shown that a period of 6 to 7 weeks is necessary for the parasite to complete its development.

FOODS—HUMAN NUTRITION.

The nutritive value of the proteins of maize, T. B. Osborne (*Science, n. ser., 37 (1913), No. 944, pp. 185–191, figs. 7*).—In a paper presented before the National Academy, November, 1912, the author summarizes experiments with laboratory animals (rats) on the nutritive value of the maize proteins, in comparison with the results of earlier studies (E. S. R., 25, p. 864).

In addition to zein, the characteristic protein, "the maize kernel contains small quantities of globulins, albumins, and proteoses, and also a protein substance insoluble in neutral solvents which can be extracted from this seed only by dilute alkalis. This latter protein has been named maize glutelin. According to such data as are at present available, zein forms about 58 per cent of the proteins of corn, the globulins, albumins, and proteoses together about 6 per cent, and the remaining 36 per cent is supposed to be maize glutelin. . . .

"Zein presents striking differences in its amino acid make-up when compared with the other proteins commonly present in foods. The greatest interest has

centered about the entire absence of tryptophane and lysin, for feeding experiments with zein were expected to shed light on the important question of amino acid synthesis by the animal.

"Maize glutelin, in contrast to zein, yields all of the amino acids commonly found in proteins and in proportions corresponding to those yielded by the majority of animal or vegetable proteins.

"The globulins, albumins, and proteoses occur in such small quantities that it has not been possible to obtain them in sufficient amount to determine their amino acid make-up or their value in nutrition."

Complete nutritive failure has been observed with zein, "maintenance with gliadin, and restoration of lost weight or normal growth with either casein, lactalbumin, or edestin. These three latter proteins yield on hydrolysis both tryptophane and lysin, which zein lacks, whereas gliadin, which is incapable of promoting growth, yields tryptophane, but only a very insignificant proportion of lysin. Gliadin resembles zein in the proportion of amino acids other than tryptophane, but differs widely from casein, lactalbumin, or edestin. . . .

"It is interesting to note that the weight lost by [the rats] was much more quickly regained when one-half of the corn gluten was replaced by lactalbumin than by edestin, results which agree with those obtained by adding these proteins to the zein diets."

The bearing of the results on problems of animal feeding is discussed.

"The results here presented leave no doubt that the deficiency observed in the practical feeding of corn meal is explained largely, if not wholly, by the unique chemical constitution of zein which forms such a large part of its proteins.

"Many more experiments must be made before the numerous questions raised by our feeding trials can be regarded as settled, and attention must finally be given to the relative food value of mixtures of various foodstuffs with corn meal, so that we may know as definitely as possible the most economical combinations to employ in maintaining mature animals and in raising the young. Such experiments must be conducted on a large scale and with a variety of domestic animals."

Such experimental work, combined with the experience gained in feeding animals for market will, in the author's opinion, "lead to a lower cost of meat production, and at the same time give us information which will contribute to a clearer understanding of some of the obscure problems of the chemical physiology of nutrition."

Influence on gastric digestion of a diet made up entirely of rice, P. Labuz (*Internat. Beitr. Path. u. Ther. Ernährungsstör. Stoffw. u. Verdauungskrank., 4 (1912), No. 2, pp. 246–252*).—The experimental data showed, according to the author, that when doves and hens were fed hulled rice only, the amount of free and bound hydrochloric acid was lowered, while the peptic strength of the gastric juice was normal. Dogs fed exclusively on a rice diet occasionally showed general disturbances, while the gastric juice was less abundant and less acid than under other conditions. These disturbances of secretion are not organic but functional in their nature.

[Order forbidding the use of polished rice in all public institutions, etc.], N. W. Gilbert (*Off. Gaz. [P. I.], 10 (1912), No. 20, p. 968*).—An executive order regarding the use of polished rice in the Philippines.

On the protective and curative properties of certain foodstuffs against polyneuritis induced in birds by a diet of polished rice, E. A. Cooper (*Jour. Hyg. [Cambridge], 12 (1912), No. 4, pp. 436–462*).—Experimental data obtained with pigeons as subjects are reported and discussed.

Yeast was found to be more efficient than the other foodstuffs tested in preventing polyneuritis. Beef was found to be relatively inefficient.

According to the author, "egg yolk, heart muscle, yeast, lentils, and barley will be effective in the prevention of beriberi. On account of their cheapness lentils and barley will probably be the most practicable for this purpose.

"The relative efficiencies of the various foodstuffs in preventing polyneuritis and in maintaining the body weights of birds fed on polished rice do not correspond. This indicates that the antineuritic constituent and the substances maintaining body weight are not identical. Evidence is brought forward in the text which seems to indicate that the latter substances are not protein, fatty, or lipoidal in nature."

With reference to the curative properties of extracts of various foodstuffs, the author states that "the antineuritic constituent [of meat] is not extracted by water and only to a small extent by ether. It is readily extracted by alcohol and after this procedure, although still insoluble in ether, is easily dissolved by water."

The curative constituent of egg yolk "is present in a form readily extracted by both alcohol and ether. It is not, however, entirely removed by the latter solvent, since an alcoholic extract of egg yolk which has been thoroughly exhausted with ether still possesses marked curative properties. These results indicate that a large portion of the antineuritic substances contained in meat and egg yolk is not combined with the fats or free (ether-soluble) lipoids, but is possibly present in the combined lipoids, which are only extracted by alcohol. . . .

"The constituent of lentils that cures polyneuritis is soluble in strong alcohol and in water, is not precipitated by basic lead acetate, and is almost entirely precipitated by ammonium molybdate. There is evidence that the active substance disappears in large quantities during the latter fractionation. It is possibly destroyed by contact with alkali. . . .

"Strychnin does not cure polyneuritis but prolongs the lives of pigeons affected with this disease."

Milling qualities of wheat—variations in the strength and gluten content of local wheats over a series of years, F. B. Guthrie and G. W. Norris (*Agr. Gaz. N. S. Wales, 23 (1912), No. 11, pp. 937–939*).—Analyses are reported and discussed of wheats grown from 1900 to 1912, which, according to the authors, show that there was no falling off in the strength or gluten content of the Farrer wheats or any other class included. See also a previous note E. S. R., 22, p. 763.

A grain of wheat, R. Chodat (*Pop. Sci. Mo., 82 (1913), No. 1, pp. 33–45*).—The author summarizes data regarding the discovery in Asia Minor by A. Aaronsohn of wild emmer (*Triticum dicoccum dicoccoides*) which, it is claimed, is the original of cultivated wheat (E. S. R., 24, p. 136). Descriptions and other data are included.

In discussing the need for adapting ferments to flours, the author states that he has isolated a leaven, "which alone or associated with other yeast causes maize dough to rise and thus allows bread to be made from it." This has been named *Amylomyces prainii* or *Mucor prainii*.

Vegetables and other products used as food in Surinam, J. Sack (*Pharm. Weekbl., 49 (1912), Nos. 6, pp. 105–113; 7, pp. 129–136*).—Data concerning fruits, roots, and other foods are included in this descriptive article.

The presence of stachyose in haricot beans and some other legumes, G. Tanret (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 26, pp. 1526–1528*).—The results are summarized of experiments showing the occurrence of stachyose in legumes.

Hardening liquid fats by hydrogenation (*Sci. Amer. Sup., 75 (1913), No. 1935, p. 71*).—A descriptive article regarding the manufacture of solid products from oils by adding hydrogen to the molecule. Such products are used in the manufacture of commercial lard substitutes.

The examination of a number of foreign marmalades, F. HÄRTEL and A. KIRCHNER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 2, pp. 91–95*).—Analyses are reported and discussed.

Historical and experimental studies of chicory and chicory coffee in relation to dietetics and hygiene, O. SCHMIEDEBERG (*Arch. Hyg., 76 (1912), No. 4–5, pp. 210–244*).—The author's general conclusion is that chickory coffee is sutiable for daily use, since it is harmless as ordinarily taken, and, in many cases, may be useful, because it stimulates appetite and digestion and hinders fermentation and putrefaction.

[Food analyses and other pure food data], A. H. JONES (*Ann. Rpt. State Food Comr. Ill., 12 (1911), pp. 424, pls. 3, figs. 15*).—The results of the examination of miscellaneous foodstuffs are included as well as reports of food inspectors, legal decisions, tentative food standards, and other similar data. State food commission bulletins issued since July 1, 1907 (Nos. 1–24) are reprinted.

[Food analyses, inspection, and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), No. 11, pp. 165–175, 178–180*).—The results of the examination of a number of miscellaneous foods and drugs are reported and a standard given regarding the examination of meat markets, together with the results of inspection work and definitions of commercial feeding stuffs.

Adulteration of food, W. J. GERALD (*Rpts. [etc.] Inland Rev. Canada, 1911–12, pt. 3, pp. 309*).—A reprint of bulletins. Those which have to do with the adulteration of food have been previously noted (E. S. R., 27, p. 268).

[Analyses of foodstuffs], CRISPO ET AL. (*Raps. Sta. Chim. et Phys. Agr. et Labs. Anal. [Belgium], 1911, pp. 20, 31, 37, 56, 69, 70*).—Data regarding the examination of miscellaneous food products in Belgium are reported.

Material for uniform laws regarding foodstuffs (*Entwürfe zu Festsetzungen über Lebensmittel. Berlin, 1912, Nos. 1, pp. VIII+19; 2, pp. VIII+76, figs. 2; 3, pp. VIII+34, fig. 1; sups. to Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), Nos. 5, 6, 8*).—The 3 parts of this series, issued from the German Imperial Bureau of Health, deal, respectively, with honey, culinary and table fats and oils, and vinegar and vinegar essence.

Experimental and other data are summarized with reference to proposed uniform legislation.

Food for a day, BERTHA M. TERRILL (*Ann. Rpt. Comr. Agr. Vt., 3 (1911), pp. 106–109*).—In this paper suggestions are made regarding proper and improper combinations of food in menus.

Cost of food, FLORA ROSE (*Cornell Reading Courses, Food Ser., 1912, No. 7, pp. 41–52*).—In this general discussion of cost and nutritive value, a table is included which compares some common foods as sources of energy, protein, calcium, iron, phosphorus, magnesium, and potassium.

The rise in prices and the cost of living—an inquiry into its extent and causes, W. J. ASHLEY (*London, 1912, pp. 16, figs. 6*).—Statistical and other data are discussed in this paper, which originally appeared in essentially the same form in the *London Evening News*, October 3–7 and 10–12, 1910.

Inquiry into the cost of living in Australia, G. H. KNIBBS (*Off. Yearbook Aust., 5 (1912), pp. 1167–1184*).—Data collected regarding household expenditures and similar topics are reported and discussed with reference to the cost of living.

[European municipal market conditions and management], Mrs. E. BLACK (*New York, 1912, pp. 32, figs. 12; Cong. Rec., 49 (1913), No. 41, pp. 2221–2224*).—This paper, reprinted in the *Congressional Record*, contains the results of an inquiry undertaken for the New York Terminal Market Commission.

Handbook of housekeeping (*Chicago, 1912, pp. 10+667, figs. 238*).—This volume is made up of the following treatises: The House, Its Plan, Decoration, and Care, by Isabel Bevier; Household Hygiene, by S. Maria Elliott; and Household Management, by Bertha M. Terrill, which were separately printed several years ago.

Nutritional physiology, P. G. STILES (*Philadelphia and London, 1912, pp. 271, figs. 23*).—In the use of this volume, designed as a textbook, the author states that supplementary reading in general biology, human anatomy, food chemistry, and dietetics is greatly to be desired, and that a certain preliminary knowledge of science is assumed. "The key word of the . . . discussion is 'energy.' The success of the reader in gaining clear conceptions of what is presented will depend upon his familiarity with the meaning of that term. It is essential that . . . [the user] shall understand that energy is latent or potential in those chemical compounds which are susceptible of oxidation. He must have learned to recognize the possibility of its unending transformation. The more readily he thinks in terms of molecules, the more profitably he can read these chapters."

The chapters deal with the energy relations of plants and animals, the nature and the means of digestion, the work of the glands, the different portions of the digestive tract, absorption, metabolism, the removal of end-products of metabolism, the energy of metabolism, the maintenance of body temperature, the hygiene of nutrition, internal secretion, the nervous system and its higher work, and similar topics.

Contribution to the physiology of the intestines.—III, Absorption of monosaccharids and disaccahrids, U. LOMBROSO (*Arch. Ital. Biol., 58 (1912), No. 1, pp. 86–104; Arch. Farmacol. Sper. e Sci. Aff., 13 (1912), No. 12, pp. 547–566; abs. in Zentbl. Expt. Med., 3 (1913), No. 6, pp. 277, 278*).—Experiments with 3 dogs weighing from 12 to 15 kg. were made to determine the comparative absorption of sugars of equal molecular concentration but of different kinds, such as saccharose, lactose, maltose, galactose, levulose, and glucose; the relation between the amount of sugar absorbed, and the concentration of the solution and the time of absorption; the absorption of a certain quantity of sugar when the animal has been fasting, as compared with the absorption during the maximum period of digestion; and the effect of atropin on the absorption of hypotonic and hypertonic solutions of sugar.

The author concludes that the intestinal absorption of monosaccharids is about equal for all the sugars used, and that hypertonic solutions are absorbed rapidly, 50 per cent being absorbed in 15 minutes. The absorption of disaccharids varies greatly with the kind of sugar, lactose being absorbed very slowly as compared with other disaccharids, such as maltose and saccharose. A relation exists between the time and amount of glucose absorbed. Hypotonic solutions when not too concentrated are less readily absorbed than isotonic or hypertonic. Very strong concentrations show a slightly lower percentage of absorption, although the quantity absorbed is greater than with less concentrated solutions. No difference was found between absorption after fasting and absorption during the period of maximum digestion.

The etiology of beriberi, R. P. STRONG and B. C. CROWELL (*Philippine Jour. Sci., Sect. B, 7 (1912), No. 4, pp. 271–413, pls. 7, figs. 29*).—Quotations follow from the conclusions drawn from an extended series of experimental studies.

"It is evident that among the individuals comprising our experiments beriberi was produced only by means of the diet, and that the disease has, therefore, a true dietetic causation. It is further evident from our experiments that beriberi develops owing to the absence of some substance or substances in the diet necessary for the normal physiological processes of the body. . . . Such a substance or such substances are evidently present in red rice and in rice polishings and also in small amount in the alcoholic extract of rice polishings, and when these articles are added to what would appear to be an otherwise physiologically proper diet, they usually prevent the development of the symptoms of the disease. In some instances, however, even when these substances are constituents of the diet, when the diet is without variation and composed of very few articles, and the individual suffers from loss of appetite and the assimilative functions appear to be poor and he loses markedly in weight, symptoms of beriberi may develop in such individuals. However, such symptoms may be dispersed by causing a variation in the diet by the addition of other nutritious substances to it. It is also evident from our experiments that the disease is certainly not an infectious one in the sense which we usually employ this term. . . .

"It is also noteworthy that the cases of beriberi developed under the most favorable hygienic conditions with exception in regard to diet. It is not probable that the infection could have been introduced with the food, since this was all freshly cooked, and at a temperature at which only a spore-bearing organism would survive. The food was also eaten a very short time after being cooked. Moreover, if the infection had been introduced with the food, the incidence of the disease should have been the same in all of the groups, which it was not. No fermentation of the rice employed occurred either before or after it was cooked. . . .

"It has been suggested that a diet of white rice predisposes to the disease, since it furnishes a better medium for the development of the specific organism which resides in the intestine of the host, and that the red rice or extract of polishings forms a preventive for the development of such a specific organism. There is no definite evidence of such an hypothesis, and, moreover, the results obtained in our experiment would argue against it. . . .

"That the disease encountered was true beriberi was confirmed definitely by the lesions encountered in the pathological study. As to the definite chemical nature of the substance or substances in the food whose presence prevents the development of beriberi, further investigations are necessary; but from a practical standpoint, as we are cognizant of the etiology of the disease, its cure and prevention is a simple problem. For the prevention and cure of beriberi in man all that is necessary is that he shall be supplied with a liberal and nutritious diet suitable to the physiological needs of the body." Recent investigations have thrown light upon the question of the nature of the protective substances in the diet, but as yet opinions are not in accord in regard to its exact chemical nature.

Included in the article are data regarding present rations in the Philippines.

A fourth contribution to the etiology of beriberi, E. B. VEDDER (*Philippine Jour. Sci., Sect. B*, 7 (*1912*), *No. 4, pp. 415–422*).—According to the conclusions drawn from experiments reported, "fowls develop polyneuritis when fed on a diet containing a sufficiency of all the alimentary principles, providing no one of the ingredients of this diet contains the neuritis-preventing substance."

This substance is probably not an alkaloid or an inorganic salt. It is destroyed by heating, but is not volatile. "Since it has been shown that this substance is not a fat, proteid, inorganic salt, or alkaloid, it seems probable that

it is an organic base, as claimed by Funk (E. S. R., 27, p. 568), but we have been unable as yet to confirm his work."

The administration of large amounts of alcohol has failed to produce neuritis in fowls.

The daily course of the renal excretion of chlorin, A. Herrmannsdorfer (*Pflüger's Arch. Physiol., 144 (1912), No. 5–7, pp. 169–228, pl. 1, figs. 2; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 4, p. 151*).—According to the results reported the chlorin excretion is greater in the morning than at night, without reference to the taking of an evening meal, which, the author believes, indicates that the activity of the kidneys is lowered at night. In general, the water and chlorin excretion were parallel. Other questions are also discussed.

[Studies of the gaseous exchange of the brain], F. G. Alexander and G. Révész (*Biochem. Ztschr., 44 (1912), No. 1–2, pp. 95–139, figs. 3*).—From these experimental studies the conclusion was reached that the augmented brain function is attended with an increased consumption of matter and energy, as shown by an increased utilization of oxygen.

The nervous system and metabolism. [Mental and muscular work] (*Jour. Amer. Med. Assoc., 59 (1912), No. 22, p. 1974*).—In discussing the higher activities of the nervous system, such as are commonly termed "mental work," it is noted that the composition of the excreta has not been found to be materially altered after intense nervous response, and that "the evidence for heightened gaseous exchange or respiratory metabolism is commonly considered to be negative.

"In accepting such conclusions respecting the apparent nonparticipation of the nervous system in the familiar augmentation of energy changes manifested by other tissues during their physiologic activity, it must be recalled that the nervous system comprises decidedly less than 5 per cent of the entire body. It is accordingly quite conceivable that small increases in metabolism, due to the greater work of this quantitatively minor organ, might be hidden in the incidental variations due to the relatively great bulk of the other tissues."

The work referred to above is cited as bearing out this contention.

ANIMAL PRODUCTION.

Introduction to biology, O. Mass and O. Renner (*Einführung in die Biologie. Munich and Berlin, 1912, pp. 394, figs. 197; abs. in Arch. Rassen u. Gesell. Biol., 9 (1912), No. 4, p. 497*).—A general treatise on the fundamental principles underlying the growth and development of plants and animals, and which devotes considerable space to a discussion of adaptation, development, reproduction, and heredity.

Annual review of investigations in general biology, edited by Y. Delage (*Ann. Biol. [Paris], 14 (1909), pp. XXXIV+545*).—A bibliography of literature published in 1909 on the cell, reproduction, heredity, variation, the origin of species, and related topics, with abstracts of the more important publications.

Organization and polarity of protoplasm, J. P. Munson (*Verhandl. Internat. Zool. Kong. Graz, 8 (1910), pp. 369–389, pls. 5*).—This is an examination of the external and internal evidence of polarity in the cell.

It is considered that protoplasm as it develops becomes more and more self-determined and less independent of external influences. The cell seems to possess the power to regulate its responses to external influences by the process of inhibition, this being the main distinction between the living protoplasm and ordinary chemical substances, the cell having the power of resistance to new factors. It is this resistance which maintains the species, or is what we call heredity.

A comparative study of the structure and origin of the yolk nucleus, J. P. MUNSON (*Arch. Zellforsch., 8 (1912), No. 4, pp. 663–716, pls. 6*).—A historical résumé of the original structure and function of the yolk nucleus, in addition to original investigations. The material was obtained from fresh ovaries of tortoise, spider, king crab, crayfish, frog, goosefish, pigeon, and cat.

"If we mean by the term 'yolk nucleus' anything in the cytoplasm which differs in any respect from the egg cytoplasm in general, there are at least four different bodies included in that term—(1) real nuclei; (2) karyolymph; (3) metaplasm; (4) the centrosphere or vitellin body. . . . When real nuclei giving the staining reaction of chromatin are found in the cytoplasm, it is evidence of beginning degeneration of the egg—not a normal but a pathological effect. . . . The karyolymph is produced by the chromatin, causing vacuoles, which in the normal cell give rise to the nuclear network from the chromosomes after karyokinesis. . . . The metaplasm when formed or in the process of forming may surround the nucleus, giving rise to a deeply staining ring. More commonly it is formed around the centrosphere, where it often obscures the latter, making an unusually large and often irregular body. . . . The sphere is the organized part of the yolk nucleus, and it is an organic part of the living substance of the egg. It is the living framework of the body originally described as the yolk nucleus in spiders.

"The true yolk nucleus (vitellin body) is a centrosphere, not a mere accidental aggregation of granules, nor an artefact due to reagents. . . . The growth of the cytoplasm of eggs is largely due to actual growth of this body, but partly also a mechanical expansion due to the accumulation of yolk. Growth seems to be by intussusception of metaplasm resulting in the formation of true yolk bodies usually laid down in zones around the sphere, which in some eggs becomes conspicuous as the latebra or nucleus of Pander. . . . The relation of this body (vitellin body or yolk nucleus) to the germinal vesicle is such as exists between the centrosome and chromosomes after karyokinesis. Its connection with the germinal vesicle and its peculiar structure is such that it serves as a reservoir into which the karyolymph is poured, and consequently becomes the seat of assimilation and growth. . . . This vitellin body is derived from the centrosome of the dividing oogonia. Only indirectly as food can metaplasm be said to take part in its formation. . . .

"As regards its origin de novo, it shares the fate of the centrosome, but affords evidence of the permanence of that body as a cell organ. The origin of centrosome de novo has not yet been proved. Published accounts of the disappearance of centrosomes are being discredited. Disappearance of such a body in a mass of yolk granules need not mean an annihilation by any means. The yolk nucleus as defined (vitellin body) does not arise from extruded chromatin, nor from migrating nucleoli, nor from leucocytes or devoured cells. It is the morphological center as it is the physiological center of the cytoplasm. It may be a center of low oxidation and a center of fermentation since it is in it that the karyolymph usually does its work of synthesis, which is suggested by the origin of metaplasm in its vicinity."

A bibliography is appended.

A metrical analysis of chromosome complexes, showing correlation of evolutionary development and chromatin thread width throughout the animal kingdom, C. F. U. MEEK (*Phil. Trans. Roy. Soc. London, Ser. B, 203 (1912), No. 294, pp. 1–74, pls. 5; abs. in Jour. Roy. Micros. Soc., 1912, No. 5, pp. 515–517; Zentbl. Zool. Allg. u. Expt. Biol., 1 (1912), No. 8–9, pp. 299, 300*).—The author measured the length and width of chromosomes in the equatorial plate of somatic and germinal cells of many species of animals.

The diameter of the component rods was found to be 0.83 microns in Nematohelminthes and in phyla above, 0.42 microns in phyla below, and 0.21 microns in protozoa. The length of the rods throughout the animal kingdom represents a series in arithmetical progression, of which the difference between terms did not exceed half of the greatest thread width. There was no correlation between rod lengths or number of chromosomes in the classification proposed by the author.

The chromatin granules of the simplest protozoa are considered as visible expressions of differentiation and aggregation of specialized particles concerned with the transmission of hereditary characters, and such granules do not represent the sole bearers of heredity in the cell. The granules become converted into rods by purely linear growth, accompanying evolutionary development and greater complexity of the organism. The increased complexity of the organism is accompanied by an increased chromatin volume in the nucleus, due to linear growth of granules or spherical chromosomes. The heterotropic or odd chromosome does not belong to the general series, for its diameter exceeds the normal thread width and appears to be undergoing some process of development or disintegration, and the author is in doubt as to its being the determining factor of sex.

A literary note on the law of germinal continuity, W. W. STOCKBERGER (*Amer. Nat., 47 (1913), No. 554, pp. 123–128*).—A historical résumé of the doctrine of the continuity of the germ plasm, which the author suggests should be known as the Jaeger-Weismann law of germinal continuity.

Genesis and environment, A. DELCOURT and E. GUYÉNOT (*Bul. Sci. France et Belg., 45 (1911), No. 4, pp. 249–332, pl. 1, figs. 4*).—This discusses in detail the results obtained by many investigators as to the permanency of the effect of environment on the germ plasm.

Note regarding the relation of age to fecundity, R. PEARL (*Science, n. ser., 37 (1913), No. 945, pp. 226–228*).—A completed record of the fecundity of a ewe for 19 years is cited as an illustration of the general curve of fecundity in animals.

Angular measurements of the skull and head, and position of the head of domesticated animals, B. FRANK (*Versuch einer Schilderung der Winkel-Verhältnisse des Schädels, des Kopfes und der Kopfstellung der Haustiere und Vorschläge zu einer Horizontalen. Inaug. Diss., Univ. Bern, 1910, pp. 82, figs. 2*).—This reports skull and head measurements of horses, cattle, sheep, goats, swine, and dogs, and discusses methods of measuring, in particular the establishment of a horizontal plane from which to make angular measurements. The value of this work in judging animals is briefly pointed out.

Studies on the specific differences between the structure of the limb bones of wild and domesticated animals, A. LOEWE (*Studien über die spezifischen Unterscheidungsmerkmale wilder und domestizierter Tiere in der Beschaffenheit ihrer Extremitätenknochen. Inaug. Diss., Univ. Bern, 1912, pp. 36*).—The differences in color, texture, chemical composition, and microscopical structure of the limb bones of wild and those of domesticated animals are discussed. The author does not agree in all respects with some commonly accepted opinions in regard to these differences.

A biblography is appended.

Bones of domesticated animals from settlements near Hasenfelde, M. HILZHEIMER (*Separate from Prachist. Ztschr., 3 (1911), No. 3–4, pp. 297–300*).—This consists of descriptions of numerous bones found in settlements of the Bronze Age in northern Germany. Among the species identified were *Bos taurus brachyceros, Capra hircus,* and the peat hog.

Clinical investigations on the normal pulse frequency of domesticated animals, A. REICHERT (*Klinische Untersuchungen über die normale Pulsfrequenz unserer Haustiere. Inaug. Diss., Univ. Giessen, 1909, pp. 63; abs. in Amer. Jour. Vet. Med., 8 (1913), No. 3, p. 170*).—This is a report of studies on the effect of breed, sex, size, food, time of day, and other factors which influence the pulse rate of horses, cattle, sheep, goats, dogs, cats, rabbits, and chickens.

Adaptation from the point of view of the physiologist, A. P. MATHEWS (*Amer. Nat., 47 (1913), No. 554, pp. 90–104*).—A paper read at the symposium on adaptation at the meeting of the American Society of Naturalists, Cleveland, January, 1913. The mutation theory of evolution and the whole theory of unit characters are considered untenable from the standpoint of physiology.

The problem of inheritance of acquired characters, R. SEMON (*Das Problem der Vererbung "erworbener Eigenschaften." Leipsic, 1912, pp. 203, figs. 6; rev. in Ztschr. Induktive Abstam. u. Vererbungslehre, 8 (1912), No. 4, pp. 337–339*).—Additional data and a further exposition of the author's views, previously noted (E. S. R., 26, p. 365) are given.

The inheritance of acquired characters, L. GRIGGS (*Pop. Sci. Mo., 82 (1913), No. 1, pp. 46–52*).—In the author's opinion enough evidence has been found in the recent work of Kammerer (E. S. R., 25, p. 171) and others to give this topic a new interest.

Inheritance of coat color in rabbits, R. C. PUNNETT (*Jour. Genetics, 2 (1912), No. 3, pp. 221–238, pls. 3; abs. in Zentbl. Zool. Allg. u. Expt. Biol., 2 (1913), No. 4, pp. 135, 136*).—Yellow Dutch and Tortoise Dutch rabbits were crossed with Himalayans. The most striking results were obtained with the factor which intensified the melanic pigment introduced by one of the Himalayans.

The Himalayan rabbit case, with some considerations on multiple allelomorphs, A. H. STURTEVANT (*Amer. Nat., 47 (1913), No. 556, pp. 234–238*).—A discussion of the "presence and absence" and "triple allelomorph" hypotheses as explanations of results obtained in experiments noted above and in other similar cases.

Analyses of grasses from Raipur and Akola, F. J. PLYMEN (*Rpt. Agr. Stas. Cent. Prov. [India], 1911–12, p. 86*).—Analyses are given of the following grasses: Sukla (*Andropogon contortus*), mothi marvel (*A. caricosus*), lahani marvel (*A. annulatus*), kel (*A. pertusos*), sheda (*Ischæmum laxum*), meshel (*Iseilema laxum*), pohna (*Setaria glauca*), and sheora (a legume).

The nutritive constituents of straw grown in Galicia [Austria], W. KOLSKI (*Ztschr. Landw. Versuchsw. Österr., 15 (1912), No. 12, pp. 1289–1298*).—Analyses are reported of the straw of wheat, barley, oats, and rye grown in different parts of Galicia. As a rule they contained less ash and fiber and more fat than most analyses of straw which have been previously reported.

Changes in the composition of a straw stack, M. PANKOV (*Zap. Novo-Alcksandi. Inst. Selsk. Khoz. i. Lĕsov., 21 (1910), No. 1, pp. 45–58*).—Samples of the interior of a stack of winter wheat straw were taken by means of a soil borer 107 days after building the stack. The percentage of water had decreased more in the center than at the top or near the walls. The loss, which was greatest in the upper part of the stack, was mainly in carbohydrates and cellulose. Of the ash constituents, there was a loss in silica, lime, magnesia, and chlorin. The amount of sulphuric acid and phosphoric acid remained almost unchanged.

Feeding experiments with pine-needle feed, M. ALBRECHT (*München. Tierärztl. Wchnschr., 56 (1912), No. 39, pp. 697–703*).—Pine needles after being ground and the resinous matter extracted were fed as a part of the ration to one cow, one sheep, and several goats without any deleterious results.

Feed stuff analyses, H. B. McDONNELL ET AL. (*Md. Agr. Col. Quart., 1912, No. 58, pp. 8*).—Analyses are reported of linseed meal, dried brewers' grains, cotton-seed meal, beef scrap, tankage, and proprietary feeds.

The composition and value of wheat screenings as a feeding stuff, M. KLING (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 189–232*).—This reports chemical and botanical analyses of wheat screenings sold as a feeding stuff under the trade name of "Kriblon."

There was a high content of weed seeds in some samples, a large percentage of which were found to be capable of germinating. Chemical analyses of the screenings and of some of the principal weed seeds found therein are given in the following table:

Composition of wheat screenings and weed seeds therein.

Kind of material.	Water.	Protein.	Fat.	Nitrogen-free extract.	Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Screenings	11.04	14.00	3.00	58.83	4.49	8.64
Ground screenings	11.08	13.69	3.29	60.70	5.85	10.65
Polygonum convolvulus	10.88	10.50	2.12	68.53	6.37	1.60
Agrostemma githago	11.24	16.13	5.98	57.00	6.33	3.32
Sinapis arvensis	7.27	28.25	28.18	22.87	9.63	3.80
Galium aparine	9.75	11.25	4.20	64.42	6.58	3.80
Convolvulus arvensis	10.32	18.50	6.00	47.58	14.05	3.55
Vicia hirsuta	11.44	27.25	.65	52.36	5.58	2.72
V. sepium	10.44	29.88	.82	49.96	6.00	2.90
V. augustifolia, var. *aterrima*	9.45	30.75	.74	49.82	6.47	2.77
Saponaria vaccaria	12.34	12.88	3.04	64.74	4.83	2.17
Erysimum orientale	8.50	27.25	28.25	25.00	6.90	4.10

Poultry foods and feeding, D. F. LAURIE (*London, New York, and Toronto, 1912, pp. VIII+188*).—Although written to furnish information to the feeder of poultry, this book is a general treatise on the science of nutrition. The chemical constitution of the proteins receives a more detailed treatment than is common in popular works on feeding animals.

The market record of 1912 (*Breeder's Gaz., 63 (1913), No. 1, pp. 8, 9*).—A general review of statistical data concerning the live-stock market in Chicago.

British export trade in live stock, E. STRACHEY ET AL. (*London: Bd. Agr. and Fisheries, 1911, pp. 47*).—This is the report of the departmental committee appointed to inquire and report as to the British export trade in live stock with the colonies and other countries.

Annual report on the frozen meat trade, 1912 (*Ann. Rpt. Frozen Meat Trade, 1912, pp. 14, pls. 2*).—This contains statistical data on meat imported into Great Britain in 1912.

Twenty-fifth annual review of the frozen meat trade, 1912 (*Ann. Rev. Frozen Meat Trade, 25 (1912), pp. 18, table 1, pl. 1*).—A summary of statistical and other data.

Cattle, sheep, and pigs, F. T. BARTON (*London, [1912], pp. 356, pls. 73, figs. 9*).—A popular work on breeds, methods of feeding, breeding, and management of cattle, sheep, and swine.

Pigments carried by cattle, C. J. DAVIES (*Live Stock Jour. [London], 77 (1913), Nos. 2024, p. 62; 2025, pp. 85, 86, figs. 4*).—The author dissolved hair pigment in potash solution, and summarizes his report as follows:

"The salient features in cattle pigmentation seem to be the universality of considerable quantities of yellow and brown pigments in every breed, and the

fact that traces of black are found in all the animals examined, though not, as far as could be made out, invariably in every hair. On this point, however, error is extremely probable, for when a hair falls to pieces (as it easily does when yellow and brown preponderate) a few granules of black would possibly escape notice.

"As cattle all carry the same 3 pigments their varying colors are obviously due to the respective quantities and arrangements of these pigments. It seems that yellow and black overlying brown gives dun; yellow only overlying brown gives yellow or red, according to the quantity of yellow present; thickly packed black and brown, even when covered by a thin layer of yellow, gives black. Yellow in any quantity in the tip makes the hair 'rusty.'"

The ancestry of the black and white cattle, L. BAKKER (*Mitt. Deut. Landw. Gesell., 27 (1912), No. 39, pp. 547–550, figs. 5*).—To offset the criticisms of his previous views (E. S. R., 27, p. 70) the author furnishes additional evidence that the German cattle of ancient times were red.

Report on the Nawagaon cattle-feeding experiment, D. CLOUSTON (*Rpt. Agr. Stas. Cent. Prov. [India], 1911–12, p. 98, pl. 1*).—Spear grass (*Andropogon contortus*), either as pasture, hay, or when made into silage, was found to be a satisfactory feed for Chhattisgarhi cattle, even without the addition of other feeds.

Stopping the leaks in cattle shipments, P. PARKER (*Pacific Rural Press, 85 (1913), No. 5, p. 134*).—A discussion of methods of loading, feeding, and other factors influencing the condition of cattle during shipment to the live-stock market.

The origin of the Mauchamp sheep, S. VON NATHUSIUS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 8 (1912), No. 4, pp. 333, 334*).—It is stated that recently discovered historical evidence shows that this breed of sheep is a hybrid and not a mutation, as formerly supposed.

The sheep and its cousins, R. LYDEKKER (*London, 1912, pp. XV+315, pls. 24, figs. 11; rev. in Country Life [London], 32 (1912), No. 831, pp. 24, 27, 28, figs. 12; Live Stock Jour. [London], 76 (1912), No. 2012, p. 431*).—This is a companion volume to the author's previous works on horses and cattle (E. S. R., 27, p. 772; 28, p. 466), and discusses the ancestry of sheep and the origin and interrelationship of modern types. The work is intended for naturalists, breeders, and others interested in the study of variations which have been brought about by domestication or other factors.

Annual wool review, W. J. BATTISON (*Bul. Nat. Assoc. Wool Manfrs., 42 (1912), No. 4, pp. 307–365, pl. 1*).—This contains an estimate of the domestic wool clip for 1912, and other statistical matter in regard to the woolen industry.

Caprine free martins, C. J. DAVIES (*Vet. Jour., 69 (1913), No. 452, pp. 62–70, figs. 4*).—This contains descriptions of different kinds of malformations of the genital organs of goats.

Pig feeding, J. M. SCOTT (*Florida Sta. Bul. 113, pp. 41–59, fig. 1*).—This bulletin contains information on the composition of feeds and method of calculating rations, and gives examples of some good rations for fattening hogs and other suggestions for profitable pork production in Florida.

Several feeding tests were made at different seasons of the year, involving 87 pure-bred Berkshires, the results of which are summarized in the following table. In experiment 4 the pigs were only 2 to 3 months of age at the beginning of the test.

Feeding tests with pigs.

Number of experiment.	Ration.	Number of pigs.	Length of test.	Average daily gain.	Cost per pound gain.
			Days.	*Pounds.*	*Cents.*
1	Corn, velvet beans in pod, Japanese cane, 1 : 1 : 2	5	51	0.71	8.60
2	(a) Velvet beans in pod	5	60	.08	.....
	(b) Velvet beans in pod, Japanese cane, 1 : 1	5	60	.01	.....
	(c) Velvet beans in pod, Japanese cane, 1 : 2	5	60	—.03	.....
	(d) Japanese cane	5	60	—.20	.....
	(e) Velvet beans in pod, sweet potatoes, 1 : 1	5	60	.04	.....
3	(a) Shelled corn	5	90	.26	8.19
	(b) Shelled corn, culled velvet beans, 1 : 1	5	90	.17	9.96
	(c) Shelled corn, culled velvet beans, shorts, 1 : 1 : 1	5	90	.26	8.98
	(d) Shelled corn, culled velvet beans, green sorghum	5	90	.24	7.96
4	Milk, shelled corn, shorts, and green sorghum	17	114	.97	11.40
5	Corn, green sorghum	10	43	.79	11.20
6	Corn, sweet potatoes, 1 : 1	10	30	.65	6.85

Experiments with pigs, R. W. Clark (*Montana Sta. Bul. 89, pp. 16*).—A report of feeding tests with high-grade Berkshires, Poland Chinas, and Yorkshires. The grain used was ground and usually soaked for 12 hours before feeding. Wheat frozen in the dough stage, which was of little or no value for milling, was used as an ingredient of the rations in many of the tests. Some of the results of the various combinations of feeds are summarized in the following table:

Summary of pig-feeding tests.

Number of experiment.	Ration.	Average weight at beginning of experiment.	Average weight at close of experiment.	Average gain per pound per day.
		Pounds.	*Pounds.*	*Pounds.*
I	Barley, beets	147.6	167.1	0.7
	Frosted wheat, beets	137.6	159.1	.76
	Shorts, beets	149.8	179.6	1.06
II	....do	131.3	181.3	.89
	Shorts and frosted wheat, 1 : 1, beets	133.5	182.0	.80
	Frosted wheat, beets	132.6	169.1	.65
III	Frosted wheat	155.5	207.7	.93
	Frosted barley	146.2	199.2	.95
	Barley	143.5	190.7	.84
	Shorts	159.2	232.7	1.31
	Shorts and frosted barley, 1 : 1	153.2	217.2	1.14
	Shorts and frosted wheat, 1 : 1	153.5	213.5	1.43
	Wheat, frosted barley, frosted wheat, 1 : 1 : 1	153.0	206.7	.96
IV	Frosted wheat	149.1	194.2	.92
	Wheat	149.8	199.1	1.01
V	Shorts, alfalfa	95.5	172.5	.915
	Frosted barley, alfalfa	93.7	160.5	.892
	Shorts and frosted barley, 1 : 1, alfalfa	96.0	164.7	.817
VI	Shorts	61.65	126.73	1.0
	Shorts and wheat, 1 : 1	60.83	118.33	.91
	Wheat	61.73	108.5	.74
VII, A	Shorts	46.3	66.4	.717
	Barley and blood meal, 11 : 1	42.6	65.1	.778
	Wheat	40.7	55.3	.521
VII, B	Shorts	71.4	137.3	.94
	Barley and blood meal, 8 : 1	73.6	136.3	.89
	Wheat	73.1	126.9	.77
VIII	Shorts, skim milk	54.58	91.96	.64
	Shorts, skim milk, grass	55.3	96.4	.70
	Shorts, skim milk	124.5	160.6	.80
	Shorts, skim milk, alfalfa hay	128.2	169.6	.96

These tests show that wheat frozen in the advanced dough stage had nearly the same feeding value as the unfrozen wheat, and that of all the single grains none on the average gave better results than shorts.

Other tests showed that young sows kept on a well-irrigated pasture of mixed grasses required more grain than did mature sows, and that the latter can be maintained more cheaply than is commonly thought, but silage of some sort should form a part of the ration. On a ration of clover hay it required about 1 lb. of grain daily per 1 cwt. to maintain the weight of a mature sow.

A yearly record is given of all the food consumed by 5 Berkshire sows and their 29 pigs. In that time the pigs produced a total gain of 4,894 lbs. and consumed 19,167 lbs. of grain, 2,405 lbs. of skim milk, 125.5 lbs. of dried blood, and 4,598 lbs. of clover and alfalfa hay. The total cost of feeding the sows and pigs at prices then prevailing was $215.13 and the value of the grain $318.11, showing a profit of $102.98.

Craniometry of the Equidæ, H. F. OSBORN (*Mem. Amer. Mus. Nat. Hist., n. ser., 1 (1912), No. 3, pp. 57–100, figs. 17*).—This article discusses methods of measuring the skulls of horses and the value of relative measurements for distinguishing blending from nonblending characters. The distinctions between horses, asses, and zebras are pointed out, and the effects of wear and other factors on measurments of teeth are discussed.

Concerning the sources of craniometric error the author says: "There are two grand sources of error in measurements of the cranium and teeth in existing domestic horses; first, polyphyly, or the mixture of ancestral stocks, or breeds; second, cenogenesis, or progressive changes due to age. The 'breed mixture' is a factor almost impossible to avoid because, as shown especially by the researches of Ewart, most of our common horses of the present day contain the blood of 4 or 5 wild and remotely ancestral stocks. To this so-called blood mixture, representing actually the persistence of certain distinctive 'unit characters,' are probably due many of the so-called variations in the skulls of horses. The only standard existing horse is the Przewalsky."

Concerning the chestnuts of horses, A. ZIMMERMANN (*Ztschr. Tiermed., 17 (1913), No. 1, pp. 1–16, figs. 5*).—A histological study of chestnuts and a discussion of the various theories which have been suggested as to their origin. A bibliography is appended.

Fertility in the Thoroughbred horse, J. B. ROBERTSON (*Bloodstock Breeders' Rev., 1 (1912), No. 4, pp. 253–266, fig. 1*).—On this study of data obtained from English stud books, it appears that although the Thoroughbred has been very closely interbred for the last 200 years he shows a higher degree of fertility than the Arab and a very much higher degree than half-breds and cart horses.

In a study of fertility in relation to the age of the mare, it was found that the fertility of the Thoroughbred mare is constant up to the twelfth or thirteenth year. On the whole the percentage of pregnancy to opportunity has remained constant during the last 100 years, and is certainly no lower than in 1850. This is contrary to the opinion expressed by some that the Thoroughbred is less fertile than 60 years ago.

Marsh ponies of our Eastern Coast, R. S. CURTIS (*Breeder's Gaz., 63 (1913), No. 4, pp. 191, 192, figs. 2*).—A general and historical account of the ponies of the islands and peninsulas of eastern North Carolina. They breed in a semi-wild condition, and probably originated from stock brought over by the earliest colonists in that region.

The American invasion, CLONMELL (*Country Life [London], 33 (1913), No. 837, p. 4**).—This discusses the probable future of American-bred horses in England.

Report of the poultry husbandman, H. R. Lewis (*New Jersey Stas. Rpt. 1911, pp. 89–135, pls. 10, figs. 7*).—Several tests to determine the effect of moisture supplied by the sand tray in artificial incubation showed that moisture prevented a loss in weight and produced a larger percentage of hatch of fertile eggs. The loss in weight is important, as it has a direct relation to the weight of chicks at hatching time. The chicks in the incubator supplied with moisture also were stronger, gained faster in weight, and had a lower mortality up to 3 weeks of age than those hatched in the dry incubator.

The wet-mash system of feeding chicks produced faster gains than the dry mash, but during the first 2 weeks the gain was offset by a higher mortality.

In tests of brooders kept at different temperatures, a high temperature for several days and also wide variations of temperature caused a heavy mortality. The most desirable temperature is stated to be for the first week 100° F., second week 96°, third week 92°, and fourth week 88°. A gasoline brooder house, recommended by the New York Cornell Station (E. S. R., 23, p. 591), was found to be satisfactory.

On November 15, April hatched pullets averaged 4.7 lbs. in weight and June hatched pullets averaged 3 lbs. At that time 16 of the early hatched pullets were laying, as compared with 2 of the June pullets. A separation of White Leghorns at 4 weeks of age into 2 lots, according to constitutional vigor, was made on May 1. On December 1 the vigorous lot weighed on the average 4.53 lbs., and the weaker lot 2.65 lbs. In the course of the season a lot of Barred Plymouth Rocks, having had free range and access to green food all of the time, averaged a little over 1 lb. heavier than a similar lot kept confined. The mortality of the 2 lots was 8 and 24 per cent, respectively. Sprouted oats, fed to laying hens in the winter, were found to increase egg production.

Methods of feeding for egg production and the replies to a circular letter concerning improvement in methods of marketing poultry and eggs are summarized with suggestions.

Poultry experiments, H. W. Jackson and W. A. Cochel (*Pennsylvania Sta. Bul. 120, pp. 24, fig. 1*).—Under natural conditions eggs not promptly incubated are warmed daily by contact with the body of the hen. In order to determine whether or not this preliminary warming has any effect on the vigor of the embryo, 2 tests were made with incubator hatched chicks. In the first test the percentage of chicks hatched from all the eggs was as follows: Not warmed, 52 per cent; warmed 1 hour daily, 63.4 per cent; warmed 2 hours daily, 47.2 per cent. In the second test the results were as follows: Not warmed, 20 per cent; warmed 30 minutes daily, 20.4 per cent; warmed 60 minutes daily, 29.6 per cent. From these results it is thought that there is some advantage to be gained from warming the eggs which are to be held for periods longer than 10 or 12 days before the regular period of incubation begins.

The effect of placing eggs in different positions in the incubator was tested. No serious disadvantage resulted from standing the eggs on end for 3 days, but eggs laid flat and turned twice daily gave better results than those kept in any other position. There was a distinct disadvantage in leaving eggs flat without turning. Eggs which had been held at different periods from 10 to 30 days were incubated, and the results, though not uniform, indicated that there was little loss in the hatchability of eggs kept for from 16 to 18 days before setting. There was a distinct disadvantage in washing eggs before incubation, and this is recommended only when the eggs are badly soiled.

Tests were made to determine the most desirable proportion of fiber in rations for laying hens. Rations containing 3.5 per cent total weight of crude fiber seemed to give better results than those with lower or higher percentages.

The hens fed rations containing over 5 per cent fiber suffered from intestinal disorders. The amount of green food consumed was governed to some extent by the proportion of crude fiber in the ration. The fowls kept in better health and laid better with bran as a source of fiber than when the fiber was furnished in the form of alfalfa meal.

Among the conclusions reached from other feeding tests are the following: "Hatchability of eggs and vigor are increased by a liberal use of corn in the rations. . . . Eggs can be produced more cheaply on a corn, bran, and meat ration than on more varied rations if the same proportionate egg yield is secured." "These experiments were made with pullets; care must be exercised in applying results to flocks of older hens." "Further experiments will be necessary to prove that a corn, bran, and meat ration is a safe ration for general use, particularly with fowls in confinement." "A ration of corn, bran, and meat scrap does not result in heavy production when long continued. Eggs from hens on such a ration are larger than where wheat is the principal grain fed."

The Leghorns, edited by J. H. DREVENSTEDT (*Quincy, Ill., and Buffalo, N. Y., 1911, pp. 144, pls. 2, figs. 152*).—A compilation of articles by different authors on the origin and history of the different varieties of Leghorns. The standard requirements and practical information on breeding, feeding, and management are given.

The modern magpie pigeon in the making, S. H. LEWER (*Feathered World, 47 (1912), No. 1216, pp. 555–557; abs. in Zentbl. Zool. Allg. u. Expt. Biol., 2 (1913), No. 4, p. 135*).—This gives an account of a strain of magpie pigeons produced by the introduction of characteristics previously lacking in the best magpie strains, and is an illustration of how an effect which selection had failed to produce was attained by a cross with a different breed.

Observations of natural propagation of oysters at Barnegat, N. J., in 1911, J. NELSON (*New Jersey Stas. Rpt. 1911, pp. 271–309, pls. 2*).—A continuation of earlier work (E. S. R., 27, p. 774), reporting observations in 1911, together with a discussion of the abnormal meteorological conditions. The season was favorable to the production of spawn and the development of the fry, but at Barnegat the spat stage was not reached. The cause of this is thought to be the unusually high temperature of the water. There is a discussion of the relation of climate and tidal flow to the number of fry, and details are given regarding the state oyster observation service, recently established.

DAIRY FARMING—DAIRYING.

Influence of Alpine pastures and meteorological factors on milk production of 27 cows belonging to the herd of the agricultural school at Rotholz, S. ULMANSKY (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1913), No. 3, pp. 339–392, figs. 13*).—Meteorological observations of the mountain pastures, continued through a series of years, are compared with climatic conditions in the Swiss valleys.

Milk records of the school herd seem to show that the cows on mountain pasture produced a smaller amount of milk than those kept in the valley. The period of pregnancy of the mountain cattle was somewhat longer, but there were no appreciable differences in the live weights of cows or in the birth weights of calves. Changes in weather affected the yield of milk and the percentage of fat, but the effect was dependent to a large extent upon the individuality of the animal.

Increasing milk flow by albuminous food, W. LIEPMANN (*Berlin. Klin. Wchnschr., 49 (1912), No. 30, pp. 1422–1424, figs. 4; abs. in Cream. and Milk*

Plant Mo., 1 (1913), No. 7, p. 30).—The addition of "malt tropon" to the normal ration of goats increased the flow of milk.

Competition between dairy herds of Red Danish cows in Funen County, 1909–1911, N. F. PEDERSEN and J. FISKER (*Ugeskr. Landm., 57 (1912), Nos. 21, pp. 301–304; 22, pp. 315–318*).—This competition is the sixth to be conducted by the agricultural societies of Funen for cows of the Red Danish breed.

The average data for 384 cows in the 11 competing herds were 9,048 lbs. of milk and 367 lbs. of butter. The two herds awarded first prize, containing 16.5 and 16.8 cows on the average for the biennial period, produced 10,260 and 9,622 lbs. of milk per head, both testing 3.79 per cent butter fat, and the average feed consumption was 6,328 and 6,503 feed units, respectively.

Questions relating to the economics of dairy husbandry and breeding of dairy cows are briefly discussed.

The dairy cow score card, C. LARSON (*Hoard's Dairyman, 45 (1913), No. 6, pp. 213, 214*).—It is pointed out that the items in the score card now in use for judging dairy cows are not closely grouped along the chief points indicating utility. The author proposes a new score card, in which the essential points of a good dairy cow are divided into six divisions, namely: Strong constitution, 20 points; large, efficient digestive capacity, 20 points; good blood circulation, 10 points; good nervous system and dairy temperament, 10 points; large udder capacity, 30 points; and symmetry and beauty of form, 10 points.

Organizing cow-testing associations and cooperative creameries, G. L. MARTIN (*North Dakota Sta. Bul. 102, pp. 26, figs. 6*).—This bulletin gives directions on how to organize creameries and cow-testing associations on lines which have proved successful in other districts. Sample plans of agreement and by-laws are given; also plans and brief descriptions for constructing a creamery plant, including an ice house and septic sewage tank.

Harm done by creamery promoters to industry, O. F. HUNZIKER (*Cream. and Milk Plant Mo., 1 (1913), No. 6, pp. 17–19*).—This is an address delivered at a meeting of the Indiana State Dairy Association on the methods of creamery promoters and why they have been detrimental to the dairy interests.

The cost of producing milk in Italy (*Bul. Agr. [Milan], 47 (1913), No. 7, p. 1*).—The annual cost of producing milk near Milan is estimated as follows: Cost of feed for 1 cow 373.5 lire, and total expense 565.5 lire, or deducting 22 lire for the value of the calf 543.5 lire. The average yield of milk is estimated at about 29 hectoliters (about 3,064 qt.), making the cost per hectoliter 18.74 lire (about 3.35 cts. per quart).

In regard to the nutritive value of raw milk, N. AUERBACH (*Ztschr. Fleisch u. Milchhyg., 23 (1913), No. 12, pp. 273–276*).—A feeding test with 6 pigs in which cooked milk gave better results than raw milk is reported.

Raw and heated milk for calves, DAMMANN (*Deut. Tierärztl. Wchnschr., 20 (1912), No. 26, pp. 397, 398; abs. in Cream. and Milk Plant Mo., 1 (1913), No. 7, p. 30*).—Milk heated to 100° C. for 1 hour was fed to 2 calves. During the course of the experiment one of the calves died, apparently from tympanitis. The other calf made equally as good gains as a control animal fed raw milk.

The control of temperatures in the pasteurization of milk, C. H. KILBOURNE (*Amer. Jour. Pub. Health, 3 (1913), No. 3, pp. 268–272, figs. 2*).—This describes a method for controlling the temperature of milk in the pasteurizer by attaching a thermostat to the outlet pipe through which the hot milk leaves the heater.

Effect of cold on milk (*Molk. Ztg. [Hildesheim], 27 (1913), No. 17, pp. 309, 310*).—A discussion of the differences between normal and frozen milk and their significance for milk inspection.

Contributions to the investigations of frozen milk, K. UTZ (*Ztschr. Angew. Chem., 26 (1913), No. 9, pp. 63–66*).—Chemical and physical constants of milk are reported in connection with a review of work done by others on this topic. From this work it would appear that in freezing weather milk inspectors should see that the milk is thoroughly mixed before sampling.

How to secure pure milk, S. HOLE (*Brit. Food Jour., 15 (1913), No. 170, pp. 21–23*).—The method to be followed by the producer, wholesaler, retailer, and consumer in order to insure a supply of sanitary milk is briefly outlined.

A contribution to the historical development of the milk problem, HELENE GRANITSCH (*Molk. Ztg. Berlin, 23 (1913), No. 13, pp. 146–148*).—A brief historical survey of laws and official regulations concerning the sale of milk in Germany.

[Interstate milk conference] (*Cream. and Milk Plant Mo., 1 (1913), No. 6, pp. 1–5*).—This is a report of a meeting of delegates of 8 of the North Atlantic States, at which many important problems connected with the inspection of milk and its products were discussed.

A unique organization of milk dealers, F. D. BELL (*Amer. Jour. Pub. Health, 3 (1913), No. 3, pp. 248–254*).—This is an account of the New York Sanitary Milk Dealers' Association, organized to improve the sanitary conditions surrounding the milk business in various ways, such as preparing educational leaflets and promoting legislation.

The theory of cream separation, O. JENSEN (*Mælkeritid., 25 (1912), No. 32, pp. 703–711*).—A lecture delivered at Dalum Dairy Institute in August, 1912, on the physical properties of fat globules, viscosity of milk, and other factors affecting the separation of cream.

Clean skimming and churning in Danish creameries, J. KYED (*Mælkeritid., 25 (1912), No. 48, pp. 1196–1202*).—Analyses of samples of skim milk and buttermilk from 779 Danish creameries showed that the skimming was quite uniform for creameries of different sizes. This also held good as regards the churning, except in the case of very small creameries.

The average percentage of fat in 4,006 samples of skim milk was 0.08, and it fell outside of the limits of 0.06 and 0.10 per cent only in exceptional cases. The average percentage of fat in 1,601 samples of buttermilk was 0.48. The degree of clean skimming was practically independent of the season, but considerable differences were found in the thoroughness of the churning during the different months of the year, especially in the case of creameries without refrigeration.

German patent office appointee's report on the Friwi method of butter making, REINSCH (*New Zeal. Dairyman, 17 (1913), No. 4, pp. 35, 36*).—A partial translation of an official report on a patented method of making butter (E. S. R., 22, p. 385).

The system of butter control in Holland, A. J. SWAVING (*Bul. Internat. Répres. Fraudes, 6 (1913), No. 53, pp. 77–86, fig. 1*).—An exposition of the laws relating to the inspection and sale of butter in Holland.

Collapsible tubes for butter (*Daily Cons. and Trade Rpts. [U. S.], 16 (1913), No. 70, p. 1485*).—A note on the use of collapsible tin tubes, which are of great advantage in shipping butter to India because of climatic conditions.

The cheese question, HERZ (*Milchw. Zentbl., 41 (1912), No. 22, pp. 677–690*).—A discussion of the problems connected with protecting the consumer from adulterated and misbranded cheese.

The composition of milk and payment for cheese milk, J. H. MONRAD (*N. Y. Produce Rev. and Amer. Cream., 35 (1913), No. 21, p. 896*).—Using data from a bulletin previously noted (E. S. R., 28, p. 578), the author maintains

that paying for cheese milk according to the fat content is a much more equitable method than according to the content of both fat and casein.

The problem of acid production by the Bulgarian lactic acid microbe, G. D. Belonowski (*Milchw. Zentbl., 41 (1912), No. 15, pp. 449–454*).—After a brief review of other work, the author describes his own experiments which indicate that the power of the Bulgarian lactic acid bacillus to produce acid is very much reduced by the addition of sugar. A high sugar content had little effect, however, on *Diplococcus güntheri*, which is often present in large numbers in commercial Bulgarian ferments.

Casein, L. A. Brown et al. (*N. Y. Produce Rev. and Amer. Cream., 35 (1913), No. 21, pp. 890, 891*).—A symposium on the cost of making, yield, profits, and market conditions of casein.

Milk sugar, J. Pedersen (*Jour. New Zeal. Dept. Agr., 5 (1912), No. 6, pp. 618–624*).—Details are given of the European methods of making milk sugar as a by-product of the dairy industry.

VETERINARY MEDICINE.

Yearly report for 1910 in regard to the advances made in animal chemistry, edited by R. Andreasch and K. Spiro (*Jahresber. Tier-Chem., 40 (1910), pp. 1527*).—This deals with the progress made in physiological, pathological, and immuno-chemistry, and pharmacology during 1910.

Protein decomposition and hypersusceptibility, A. Schittenhelm, W. Weichardt, et al. (*Ztschr. Expt. Path. u. Ther., 10 (1912), No. 3, pp. 412–447; pp. 449–478, pls. 4; 11 (1912), No. 1, pp. 69–101, pl. 1, figs. 8; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 5, pp. 580–583*).—The first of these articles, in which W. Grisshammer is joint author, deals with the influence which protein substances of various kinds, given parenterally, have upon the blood picture; the second, in which F. Hartmann is joint author, with the effect of giving various protein substances parenterally upon body temperature; and the third with the biological differentiation of proteins and protein cleavage products by the action which they have upon the animal organism.

A further contribution to the biological determination of pregnancy, E. Abderhalden (*Hoppe-Seyler's Ztschr. Physiol. Chem., 81 (1912), No. 1–2, pp. 90–98*).—Continuing work previously noted (E. S. R., 27, p. 881), attention is drawn to the fact that it is necessary to have good reagents for detecting the peptone liberated in the dialysis method. The reagent best suited is a solution of triketohydrindene hydrate, which yields a fine blue coloration when the test is made with the dialyzate. The dialysis method, which employs coagulated placenta protein instead of peptone, as used in the polariscopic method, is described in detail.

The results of some tests with pregnant and nonpregnant cows are given. In no instance was a positive result obtained with a nongravid animal.

New results in the field of ferment research.—Their use in clinical diagnosis, especially for diagnosing pregnancy, Weil (*Abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 45, pp. 827, 828*).—After pointing out the rôle which enzyms play in the field of medicine the author describes the Abderhalden method for diagnosing pregnancy. As the optical method is too expensive the author recommends the dialysis method in its stead.

The morphology of the blood of laboratory animals, C. Klieneberger and W. Carl (*Die Blut-Morphologie der Laboratoriums-Tiere. Leipsic, 1912, pp. VI+109, pls. 14*).—The blood of the white mouse, rat, guinea pig, rabbit, cat, dog, hedgehog, ape, sheep, fowl, pigeon, and frog was examined and observations

made on the age, sex, and method and time of feeding, and in the case of certain animals, hibernation, period of heat, and pregnancy. Some of the organs were also examined histologically.

The heart and its variation in weight in mammals, A. MAGNAN (*Compt. Rend. Soc. Biol. [Paris], 73 (1912), No. 36, pp. 657–659*).—The author reports studies made of the weight of the heart in 29 species of mammals, including Herbivora, Granivora, Omnicarnivora, Frugivora, Piscivora, Omnivora, Carnivora, and Insectivora.

A contribution to the pathological anatomy and histology of the suprarenal capsules of domestic mammals, A. URVIČ (*Közlem. Összehasonl. Élet es Kortan Köreböl, 10 (1912), No. 3–4, pp. 130–174, figs. 11*).—This inaugural dissertation includes a bibliography of 57 titles.

Special pathology and therapeutics of the diseases of domestic animals, F. HUTYRA and J. MAREK, edited by J. R. MOHLER and A. EICHHORN (*Chicago, 1913, vol. 2, pp. XVII+1018, pls. 5, figs. 163*).—This is the second volume of the first American edition of this work, the first volume of which has been previously noted (E. S. R., 27, p. 679).

The diagnosis of anthrax by Ascoli's thermoprecipitation method, A. FLEMMING (*Die Diagnose des Milzbrandes vermittels der Ascolischen Thermoprazipitationsmethode. Inaug. Diss., Tierärztl. Hochsch. Hannover, 1912; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 6, pp. 626, 627*).—This reaction is specific and usually produces a precipitate in about 5 minutes, whereas material from subjects not affected with anthrax never produces a precipitate within 15 minutes' time. No definite degree of dilution can be stated for the reaction, because the test depends in all probability upon the number and virulence of the anthrax bacilli present, the time of extraction, and the temperature at which the extraction was made. In many instances a dilution of 1:400 gave a marked reaction. Every organ of the body can be used for preparing the extract. The preference, however, is to be given to the spleen.

Putrefaction of the original material, its preservation by 96 per cent alcohol or concentrated formaldehyde solution (from 2 to 5 days), or heating to from 60 to 110° C. for 30 minutes do not destroy the material so far as obtaining a reaction is concerned.

The practical value of anthrax antiserum and vaccine.—Preliminary report, J. D. E. HOLMES (*Indian Civ. Vet. Dept. Mem. [1912], No. 3, pp. 248–271*).—"A potent antianthrax serum can be prepared from cattle, sheep, and horses; the serum prepared by injections of 48 hours broth cultures, to which was added an emulsion of anthrax bacilli from agar surface growth, gave best results. The serum protects sheep in a dose of 10 cc. Twenty-five cc. gives protection to country-bred ponies, mules, and donkeys; 100 cc. is necessary for Australian horses. These doses protect against the virus inoculated from 24 to 48 hours before or after the serum, also against simultaneous inoculation of the virus.

"As cattle are little susceptible to the inoculated virus, it is difficult to determine the protective dose against natural infection. In the field operations, doses of from 5 to 20 cc. have given good results. The immunity following an injection of 25 cc. serum persists for at least 3 weeks, in some cases longer. The immunity resulting from the combined use of serum and virus was tested up to 6 weeks. It probably lasts for some months."

About anthrax and erysipelas anaphylatoxin, K. BIERBAUM and K. E. BOEHNCKE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 2, pp. 159–168; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref. 6 (1912), No. 5, p. 583*).—From either boiled or fresh anthrax or erysipelas bacteria an anaphylactic poison can be obtained in vitro. From extracts of the anthrax bacillus

this was not possible. For the scission of anaphylatoxin the presence of specific immune amboceptors is not necessary, and an excess was even detrimental to toxin formation.

Repeated freezing of the erysipelas bacterium at —8° C. has no influence on the scission of the toxin. Digestion of the erysipelas bacterium with inactivated guinea pig serum and injecting the supernatant fluid produces in some instances typical anaphylactic phenomena.

The pathology of foot-and-mouth disease, E. ZSCHOKKE (*Schweiz. Arch. Tierheilk., 54 (1912), No. 11, pp. 505–521, figs. 8; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 4, pp. 355–359*).—The virus of foot-and-mouth disease is very easily destroyed; in the dry state and exposed to daylight it perishes within 24 hours and in feces of cattle and pigs it survives but a short time. Weak disinfectants destroy it as does heating to 50° C. for 15 minutes. On the other hand in germ-free media sealed up in glass tubes and protected from light it may retain its vitality for from 3 to 4 months, and in the dry state protected from light, as in clothing, it may remain virulent for several days and even for from 1 to 2 weeks.

It having long been suspected that the virus may remain latent in clefts and cracks in the claws, the author has conducted investigations along this line on a large number of cattle that were killed on account of the disease. The evidence has led to the assumption that the virus can exist in apparently sound horn and be liberated when the horn is cut away. The vesicles of the corium are possibly the most constant lesions and it is possible that it is in these vesicles or under the horn that the virus persists. It is more than probable that the virus can not persist for any length of time in those vesicles which are open to the exterior and which consequently are liable to contamination with dirt.

"In the majority of cases it is not possible to furnish absolute proof that foot-and-mouth disease has been in existence after an interval of some weeks, but now and then cases occur in which a probable diagnosis can be made."

"The feet of animals which had been diseased from 5 to 8 months previously showed nothing specific. Here and there there were clefts in the soles such as are frequently observed in sound animals, and there was marked ring formation on the walls. It is obvious that such appearances may be produced by causes other than foot-and-mouth disease, and at this stage it is no longer possible to arrive at a definite opinion as to whether the animal has been affected with foot-and-mouth disease or not."

In regard to the formation of specific antibodies in the blood from horses with the aid of glanders antigens, J. ZURKAN (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 6, pp. 473–480; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 52, pp. 977, 978*).—Mallein, Marxer's farase, killed cultures of glanders bacilli, and malleo-aggressin given subcutaneously to horses produce specific antigens—precipitins, agglutinins, complement fixation substances, and bacteriolysins. Malleo-aggressin and Marxer's farase were the best antibody producers, while the weakest was mallein. Malleo-aggressin, on the basis of the investigation, is considered a good substance for immunizing horses against glanders.

Glanders in Waipio Valley, V. A. NORGAARD (*Hawaii. Forester and Agr., 9 (1912), No. 12, pp. 356–358*).—The author finds that the intradermal mallein test, which was used during an outbreak of glanders in the Waipio Valley in which 28 animals were affected, is an absolute success. In the test 2 drops of mallein were injected on the side of the neck. Within 1 hour from the time of injection the minute swelling, at first the size of a small pea, had enlarged to the size of a hazelnut and in a number of cases reached dimensions of from

4 to 5 in. during the evening. On the morning following, the swelling in most of the affected animals was so painful that it was almost impossible for them to move the leg, whereas in the unaffected animals the swellings were barely the size of a bean and were neither sore nor hot.

A critical study of a case of myiasis due to Eristalis, M. C. HALL and J. T. MUIR (*Arch. Int. Med., 11 (1913), No. 2, pp. 193–203; abs. in Science, n. ser., 37 (1913), No. 941, p. 78*).—The authors report a case of intestinal myiasis due to *Eristalis* sp., in a 5-year-old boy at Colorado Springs, Colo. It is stated that there have been only 7 published cases of myiasis credited to rat-tailed larvæ. The paper includes a critical review of the literature relating to the subject of myiasis, due to syrphid larvæ.

Antistreptococcic serum in the treatment of Purpura hemorrhagica, VERLINDE (*Abs. in Ann. Méd. Vét., 60 (1911), No. 12, pp. 710–712; Vet. Rec., 24 (1912), No. 1229, p. 476*).—A considerable reduction in mortality has been noted during the 4 years in which this serum has been in use. The reduction has been from 50 to 0 per cent.

Facts and theories about stijfziekte and lamziekte, A. THEILER (*Agr. Jour. Union So. Africa, 3 (1912), Nos. 4, pp. 463–478; 5, pp. 639–650; 6, pp. 778–785; 4 (1912), No. 1, pp. 1–56, figs. 16*).—This is a preliminary communication consisting of notes and observations.

Part 1 consists of a historical review with particular reference to researches and investigations conducted by the late Dr. Hutcheon and assistants; part 2 of a comparison with diseases in other parts of the world in which a deficiency of phosphates is noted or which show similar symptoms to stijfziekte and lamziekte; and part 3 of recent observations made in South Africa compiled from various sources and particularly dealing with investigations and experiments conducted by the author. Part 4 describes the 4 different clinical forms of lamziekte and the post-mortem findings, reports experimental investigations of the manner in which the disease is transmitted, and discusses the theories of the cause of the disease.

On the so-called types of the tubercle bacillus, O. MALM (*Jour. Compar. Path. and Ther., 25 (1912), No. 3, pp. 202–216*).—This is a critical discussion of the work done on the transmission of bovine tuberculosis to man reported by the German investigators Koch, Rabinowitsch, Kossel, and Weber. The findings are compared with those obtained by Theobald Smith and the English Tuberculosis Commission.

In regard to the features which are supposed to place tubercle bacilli in this or that class, the author states that since 1892 and up to September, 1912 "[he has] successively and repeatedly tested these distinctive features (except as regards white mice), but [has] not been able to confirm their invariability, so that they could be used as distinctive features. Neither morphologically, culturally, nor biologically is there any invariable or well-defined difference between the bacilli of mammals, whether they are descended from a human being, a cow, a horse, a pig, a dog, or a parrot; especially not when the cultures are some generations old and are adapted to the cultivating media. At first the bovine bacilli undoubtedly show more difficult and slower growth, but at other times they grow perfectly well; and occasionally even avian bacilli adopt characteristics which culturally make them just like the human or the bovine bacilli. Especially cultures on serum or glycerin-agar frequently behave exactly alike. And to found a doctrine of 2 separate types, of such wide reaching importance as the assertion of a bovine and a human tubercle bacillus type, on some unessential and inconstant differences in growth in some culture media, would be far too hazardous and unwarrantable a proceeding."

The author claims that when a bacillus of human origin is found nonvirulent in cattle and rabbits, it simply means that the bacillus has become habituated to the human organism. The human and bovine bacillus are considered identical.

The normal temperature of the healthy and tuberculous guinea pig and the effect of serum injections upon the rectal temperature of the guinea pig, E. Bräuning (*Die Normaltemperatur des gesunden und des tuberkulösen Meerschweinchens und die Einwirkung von Seruminjektionen auf die Rektaltemperatur des Meerschweinchens. Inaug. Diss., Univ. Leipsic, 1911, pp. 54*).—The maximum internal temperature of normal guinea pigs is between 37.1 and 40.5° C. and in tuberculous animals between 37.4 and 40.1°. The maximum temperature is generally present in the afternoon. In most instances, however, the temperature varies in sound animals between 37.9 and 39.4°, and in tuberculous animals between 37.8 and 39.7°. The minimum temperature for healthy animals lies between 37.1 and 39°, and in tuberculous animals between 37.5 and 39.2°.

A single injection of inactivated horse serum (0.1 cc. intracardial or intravenous, 1 cc. intramuscular, and 5 cc. intraperitoneal or subcutaneous) showed no marked increase in the average temperature. The intraperitoneal injection caused a fall in the average temperature on the day of the injection, but it rose again to its regular level on the following day. When the amounts of serum were increased the regular average minimum temperature of the animals was increased to some extent.

Combating tuberculosis in Sweden, G. Regnér (*Erfahrungen über Rindertuberkulosebekämpfung. Stockholm, 1911, pp. 79*).—This deals with the results obtained in combating tuberculosis in Sweden during the years 1907–1909. The reactions obtained with the tuberculin test are reported in detail, and the various factors which interfere with the successful eradication of tuberculosis are dealt with critically. The tuberculin test was initially applied to 49,112 animals, of which 28.9 per cent reacted. In these same herds up to the year 1909 there were 57,734 animals, of which 3.1 per cent reacted.

The internal use of carbolic acid for the prevention of contagious abortion in cattle, with some notes on the relation of granular vaginitis to abortion, W. J. Taylor (*Montana Sta. Bul. 90, pp. 17–31, figs. 5*).—The experiments here reported which were carried on in 3 herds have led the author to the following conclusions:

"Carbolic acid, either fed in solution or injected hypodermically, seems to be a specific against contagious abortion. Cows as a rule will eat with apparent relish as much as 750 cc. of a 4 per cent solution of carbolic acid in feed daily. The hypodermic injection as a treatment in an affected herd involves less labor than feeding. In cases of impending abortion carbolic acid can be injected in sufficient quantity to cause staggering gait and dilation of the pupil of the eye (when it should be withheld for from 10 to 15 hours and repeated) with no apparent unsatisfactory after effects. All males used for breeding purposes should be treated as indicated. Contagious abortion and granular vaginitis may be transmitted through the medium of the male, unless proper precautions are observed. Not all cows showing granular vaginitis abort. Heifers pregnant for the first time are more liable to abort than during subsequent periods of gestation and should be carefully watched and vigorously treated if abortion exists in the herd."

Symptoms and lesions presented by cattle and carabaos suffering from rinderpest in the Philippine Islands, W. H. Boynton (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 12, pp. 644–652, pls. 3*).—"The most constant clinical symptoms of rinderpest are (a) rise in temperature above normal, the temperature remaining high throughout the course of the disease or until just

prior to death, when it frequently drops to subnormal; (b) a dejected appearance of the animal, lopping of ears, head lowered, eyes sensitive to light (in carabaos there is congestion of the eyes); (c) diarrhea, loss of appetite, thirst, emaciation, prostration, congestion, and discharge from all mucous membranes.

"The most constant morbid appearances, in order of frequency with which I have observed them, are (a) peritonitis; (b) congestion and ulceration of the fourth stomach; (c) congestion of the duodenum, cecum, colon, and rectum; (d) congestion of the vagina, glands, penis, and sheath; (e) erosions in, and congestion of, the larynx; (f) congestion of the brain and spinal cord; (g) enlargement of the lymphatics, especially those located in the mesentery."

The campaign against rinderpest, A. R. WARD (*Philippine Agr. Rev. [English Ed.], 5 (1912), No. 12, pp. 630–643*).—A detailed account of the work carried on against rinderpest in the Philippines.

The preparation of antirinderpest serum by the injection of virulent artificial peritoneal fluid, H. E. CROSS (*Indian Civ. Vet. Dept. Mem. [1912], No. 3, pp. 206–215, figs. 6*).—By using a peritoneal fluid prepared by injecting a 0.5 per cent potassium citrate solution[a] into the peritoneal cavity of Himalayan bulls which are highly susceptible to rinderpest, "the amount of virulent material for hyperimmunizing purposes is considerably increased, and a marked saving in the cost of serum preparation effected. The serum from animals injected with artificial peritoneal fluid is usually weaker than the serum prepared by the injection of blood. Artificial peritoneal fluid injections are well absorbed and do not produce sloughing."

Cutaneous sarcosporidiosis in a cow, C. BESNOIT and V. ROBIN (*Rev. Vét. [Toulouse], 37 (1912), No. 11, pp. 649–663, pls. 4, figs. 2*).—The authors report studies of a case of cutaneous sarcosporidiosis in the cow. This is said to be the first report of the occurrence of a species of Sarcocystis in the skin. The parasite is thought to represent a new species. Experimental infestation failed. parasite is thought to represent a new species. Experimental infestation failed.

Estimating the value of antidysentery serum (calf), G. GROSSO (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 1, pp. 54–69; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1912), No. 5, pp. 572, 573*).—The serum is tested on guinea pigs, which either receive the serum and bacteria simultaneously or the serum intraperitoneally 5 hours before the culture. From the tests it is concluded that with certain representative types of bacteria an efficient serum against other types of calf dysentery coli bacteria can be obtained. Polyvalent sera are without value.

El-R'och (cachexia and progressive anemia of ovines) and the bacillus of Preisz-Nocard, A. BOQUET (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 20, pp. 471–475*).—The author states that the disease, known in Algeria by the name of "El-R'och" and generally attributed to strongyles in the stomach, appears to be due to the action of a form of the Preisz-Nocard bacillus which multiplies at one point, the toxic products of metabolism of the bacillus causing a progressive intoxication. The bacillus is thought to be identical with that isolated in 1905 by Bridré[b] from the pus of lambs affected by caseous pseudotuberculosis and to resemble in certain characteristics the organism described by Carré (E. S. R., 27, p. 887) as the pyobacillus of the sheep and goat.

The "braxy" type of sheep disease in Australia, J. A. GILRUTH (*Reprint from Austral. Assoc. Adv. Sci., 13 (1912), pp. 567–616, pls. 2*).—The author reports studies made of the "braxy" group as appearing in Tasmania and Vic-

[a] Philippine Jour. Sci., Sect. B, 3 (1908), No. 5, pp. 407–416, figs. 10.
[b] Compt. Rend. Soc. Biol. [Paris], 59 (1905), No. 25, pp. 117, 118.

toria, Australia, together with a summary of investigations of the other diseases of the group.

"The causative organism studied here is an anaerobic sporulating bacillus morphologically similar to that of blackleg, the chief distinguishing cultural characteristic being the biconvex, disk-like colonies in agar media.

"The most convenient method of cultivating the bacilli after isolation is to place in broth or serum broth media a small portion of dried muscle containing spores, exclusion of the air being unnecessary. The Tasmanian and Victorian diseases, though similar in all essential details, yet differ in minor points, such as seasonal and age incidence (the former occurring in winter and practically confined to yearlings, the latter occurring in summer and practically confined to 2-year olds), in the virulence for cattle and rabbits, and in some slight morphological and cultural characters of the pathogenic bacilli. That the diseases are but varieties of the one is, however, definitely proved by immunity to one implying immunity to the other. Cultivations of the pathogenic bacilli (at least those studied here) in glucose broth result in a rapid though gradual weakening of virulence. By the use of such weakened cultures immunity may be produced, but experiments in the field are required to ascertain if such a method may be used economically and with safety.

"The group of diseases is allied to malignant edema and to blackleg, but there are certain definite phenomena which clinically serve to distinguish them, while the results of immunity experiments negative a very close relationship. Feeding with virulent cultures of the bacilli results in the rapid and definite production of immunity, the season of the year being immaterial. Certain circumstances predispose to the infection, notably condition and age, but probably the seasonal influence which appears to be a predisposing factor is due chiefly to the opportunity under natural conditions for skin punctures by contaminated prickles, etc., occurring at definite periods of the year. The direct introduction of the bacilli by means of internal metazoan parasites is very improbable, if not impossible, in view of the results of feeding experiments.

"For the group of diseases dealt with the established British name 'braxy' is recommended in preference to any other."

Contribution to the study of the pathological anatomy and histology of the liver of the hog, M. Kelemen (*Közlem. Összehasonl. Élet es Kortan Köreböl, 10 (1912), No. 3–4, pp. 81–129, figs. 9*).—This inaugural dissertation includes a bibliography of 53 titles.

On a dermatomycosis of swine, H. Barthélemy (*Bul. Soc. Cent. Méd. Vét., 89 (1912), No. 24, pp. 632–634*).—The case of dermatomycosis here reported is thought to have been due to *Trichophyton felineum* or a form very similar.

Further investigations of contagious cerebro-spinal meningitis (Borna disease) of the horse with particular consideration of the manner of infection and of the nuclear inclusions, E. Joest (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 10 (1911), No. 5, pp. 293–320, pls. 2, fig. 1; abs. in Berlin. Tierärztl. Wchnschr., 28 (1912), No. 52, p. 976*).—In continuation of the investigations of the pathological histology, etc., of this disease, previously noted (E. S. R., 26, p. 786), the author reports studies of the portals of entry and of the nuclear inclusions of the ganglion cells.

In all of the 27 cases of Borna disease recently investigated, as well as in the 10 cases studied earlier, the olfactory bulb showed extremely characteristic changes in the way of an inflammatory infiltration. In all the cases the glomerular layer was the part of the olfactory bulb in which the greatest change was found. The olfactory nerves as well as the bulb showed inflammatory changes.

The investigations have led the author to conclude that the marked attack of the olfactory bulb, together with the findings in the olfactory convolution and the remaining segments of the brain, furnish proof that the characteristic inflammatory process, which is the basis of Borna disease, begins in this part of the brain. Thus the disease of the nervus olfactorius and its covering (as well as the pia) furnish proof that the agents which cause the inflammation gained entrance through the olfactory bulb. This is thought to be sufficient patho-histologic evidence that in Borna disease the infection passes from the nasal cavity through the nervus olfactorius, or more accurately through the lymph channels of these nerves. The author found no changes in the nasal cavity that could be said to be characteristic of Borna disease.

The nuclear inclusions found in Borna disease are considered as probably reaction products of ganglion cells resulting from the invasion of an organized parasitic agent that can be classed with or near the Chlamydozoa.

Enzootic cerebro-spinal meningitis of the horse, J. LESAGE and M. FRISSON (*Rev. Gén. Méd. Vét., 20 (1912), No. 240, pp. 657–665*).—The authors report studies made during the course of an outbreak of cerebro-spinal meningitis in the communes of Haute-Saône and Côte-d'Or. The organism found in the blood and nerve centers of animals dead of the disease did not possess any pathogenic power that was demonstrable by ordinary inoculations.

Treatment of epizootic lymphangitis with neosalvarsan, E. HOUDEMER (*Rev. Gén. Méd. Vét., 21 (1913), No. 241, pp. 4–6*).—Six of 7 cases of epizootic lymphangitis to which 1.5 grains of neosalvarsan to 250 cc. distilled water was administered intravenously were completely cured, and the author thinks that the seventh horse, which was nearly cured, would certainly yield to a second injection.

Vaccination tests for determining the value of Dr. Schreiber's lymph against strangles, A. ZOERNER (*Impfversuche zur Bewertung von Dr. Schreibers Druselymphe. Inaug. Diss., Univ. Bern, 1910, pp. 55*).—This preparation can be used subcutaneously or intravenously with safety for this condition, and its activity does not depend upon the aggressins (Bail). In most cases a single injection of the lymph will control the disease. The fever is reduced, the general condition of the patient improves, and when used early enough it will prevent metastasis, thus keeping the disease localized. The nasal secretion is at first increased, but later goes back quickly to normal.

The lymph can also be used for actively immunizing healthy horses, foals, and suckling foals. In severe cases a second injection may be necessary.

Results obtained in the experimental immunization of mules to the fatal trypanosomal disease of horses in Panama (*Rpt. Dept. Sanit. Isthmian Canal Com., 1912, Dec., pp. 41–43*).—A strain of *Trypanosoma hippicum* that had survived in a guinea pig for 336 days showed upon subinoculation in a mule on the two hundred and seventy-ninth day and in a dog on the three hundred and thirty-sixth day very feeble pathogenic powers when compared with all other strains and with the same strain at an earlier period of the infection in the guinea pig. Both became infected, the mule after a prolonged incubation period, but both recovered from the infection. "The mule was definitely infected and passed through a typical attack of the disease, but later grew fat and was in good condition. The mule's condition continued excellent and on January 8, 1912, one year after his infection by the avirulent strain, hemagglutinins had disappeared and 10 cc. of undiluted blood were inoculated into 2 very susceptible animals, a white rat and a guinea pig, but both remained free from infection."

A second mule was experimentally inoculated by means of house flies with the same avirulent strain. The period of incubation was prolonged to 10 days and the animal passed through a typical attack.

In each case there was recovery from infection and return to normal physical condition, and the animals were demonstrated free from infection by animal subinoculation. In one animal specially tested there was a resistance to reinfection by the same strain and resistance to infection by a virulent strain as well.

The virus of fowl pest a globulin, MROWKA (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 67 (1912), No. 4, pp. 249–268*).—Assuming that the filterable virus causing this disease was of a colloidal nature, it was found that the precipitate produced by tannic acid when injected into fowls was capable of producing the disease and death. A protein from normal serum did not produce the disease.

When the ovarian tissue having the small eggs attached was rubbed up in a sodium chlorid solution and the protein precipitated with tannin, a product was obtained which, when injected into birds, was lethal. This demonstrates that the toxic substance passes over into the egg, and Centanni's findings are thus corroborated. All eggs were not toxic.

In order to establish whether the globulin or the albumin was the toxic substance, dialysis and precipitation tests with ammonium sulphates were resorted to, using the serum obtained from the pericardium. Inoculation with the globulin obtained in both cases produced a positive result, and albumin a negative one. The globulin precipitated in dialysis was found to be soluble in 10 per cent sodium chlorid solution, but lost its virulence when so treated. That precipitated by ammonium sulphate was easily soluble in water and on solution retained its virulence. The virus is present in the sol and gel condition and is reversible.

About the fat contained in the tubercles of the fowl, G. VALLILLO (*Tuberculosi, 4 (1912), No. 9, pp. 257–263; abs. in Ztschr. Immunitätsf. u. Expt. Ther., II, Ref., 6 (1913), No. 7, p. 685*).—The nodules which were not necrotic and consisted of epithelial and giant cells contained either no fat at all or only small droplets of fat in their centers. Many fat droplets were noted in the center of necrotic tubercles, particularly in the protoplasm of the giant cells, but in the more necrotic portions and in their connective tissue capsule very little fat was present.

RURAL ENGINEERING.

Garden irrigation, S. HARGRAVES (*Ann. Rpt. Vt. State Hort. Soc., 9 (1911), pp. 33–41*).—This article points out the possibilities of promoting successful market gardening in Vermont by means of supplemental irrigation to tide the crops over the destructive dry spells which occur between periods of abundant rainfall. Considerable rainfall and other data are given relative to economic supplemental irrigation in Vermont, the conditions surrounding such systems in operation, and experimental systems in other States. It is suggested that, in connection with the use of available surface water supplies, from 1 to 3 good wells be maintained on the average-sized farm to insure an ample supply of water when most needed.

The results of various inquiries indicate that for market-garden irrigation pumping the centrifugal pump with gasoline engine power gives the best all-round satisfaction for ordinary lifts below 75 ft. It is concluded that the final success of such work will depend almost entirely on the man in charge, and that in addition to being a fairly good mechanic he must be already a successful and experienced gardener.

Tile drainage on the farm, A. G. SMITH (*U. S. Dept. Agr., Farmers' Bul. 524, pp. 27, figs. 15*).—This is intended to supersede Farmers' Bulletin 187, previously noted (E. S. R., 15, p. 934), and deals with tile drainage only. With the exception of a brief discussion of cement tile and their manufacture, a slight revision of cost data, and the suggestion of the use of cement stone or brick bulkheads for tile-drain outlet protection, the material contained is substantially the same as that on tile drainage in the previous publication, but it is intended to cover the subject from the farmer's point of view rather than to apply to large drainage projects involving engineering problems.

Supplemental report No. 2 on Nelson Avenue experimental road; and supplemental report No. 1 on experimental road work in Darke County, Ohio (*Ohio Highway Dept. Bul. 15, 1911, pp. 15, figs. 13*).—This bulletin contains 2 reports on the existing physical conditions of 2 experimental roads previously noted (E. S. R., 27, p. 587). The Nelson Avenue experimental road is described and the report states that after 2 years' service under fairly heavy traffic most of the sections presented smooth uniform surfaces and were in satisfactory condition with respect to the life and action of the various binders.

The report on the experimental road work in Darke County states that after 2 years the sections of washed gravel, bound with asphalt, were in satisfactory condition, but that the sections consisting of washed gravel, bound with crude oil tar; washed gravel mixed with 30 per cent crushed bowlders, bound with asphalt; crushed bowlders water-bound, bound with clay and limestone; and washed gravel mixed with 30 per cent crushed bowlders, bound with clay and limestone were in unsatisfactory condition, indicating that these types of construction are not adapted to heavy traffic roads.

Report of proceedings of the tenth annual convention of the Kansas State Good Roads Association (*Kans. State Good Roads Assoc. Proc., 10 (1912), pp. 58, figs. 22*).—A report of the proceedings of this association.

Preventing dampness in masonry (*Engin. Rec., 67 (1913), No. 3, pp. 82, 83, figs. 4*).—This method of preventing dampness in masonry walls, foundations, etc., is based on the principle that fluids and gases when mixed together in a vessel arrange themselves according to their specific gravities. Porous hollow bricks are placed in an inclined position in the wall so that the moisture in the masonry is conducted by capillary action to them and is there evaporated on the walls of the circular hole. The size of the hole in the brick should be between 1 in. and 1½ in., depending on the porosity of the brick, so that the friction losses in the hole will not overcome the small differences in the specific gravities of dry and moist air and prevent circulation. The inclination must be such as to permit free circulation through the entire length of the brick. These bricks are placed in rows above each other. The area of action is of circular shape and its diameter varies from 5 to 11 times the diameter of the hole, so that areas of action of adjacent bricks must overlap to prevent moisture rising between them.

This method has been successfully tested and applied to several old structures. It has been found that the time necessary to dry an old wall depends on the thickness and varies from 30 to 150 days.

Suction gas plants and engines, W. S. H. CLEGHORNE (*Agr. Jour. Union So. Africa, 4 (1912), No. 4, pp. 587–597, figs. 7*).—This article outlines in detail and illustrates the construction and operation of suction gas plants and engines, which are extensively employed by farmers in South Africa for irrigation pumping and other farm power purposes.

Tests by the Royal Agricultural Society on a plant gave the following results with anthracite coal, working continuously at the specified load; Full load,

1.1 lb. per effective horsepower hour, including fuel needed for starting and for banking during the night; half load, 1.6 lbs. per effective horsepower hour, including fuel for starting. By the use of charcoal instead of anthracite coal the above results are increased by about 25 per cent. One gal. of water was used per effective horsepower hour at full load and ¾ gal. at half load.

[Location of internal combustion engine troubles], V. W. Page (*Sci. Amer. 108 (1913), No. 2, pp. 34, 35, fig. 1*).—A drawing showing every part in section of a 4-cycle internal combustion engine is accompanied by a chart of tables which outlines in a simple manner the various troubles and derangements that interfere with efficient internal combustion engine action. The parts and their functions of the type of engine illustrated are practically the same in all internal combustion engines of the 4-cycle type, and the general instructions given apply to all hydrocarbon engines. The various defects that may materialize, and their symptoms are indicated, and the remedies are briefly noted.

The penetration system of orchard spraying, A. L. Melander and R. K. Beattie (*Washington Sta. Bul. 106, pp. 40, figs. 15*).—The equipment deemed necessary to obtain the most effective results with the penetration method of orchard spraying consists of a nozzle, which will produce a coarse penetrating spray; a crook, for forcibly directing the spray downward; a high pressure pump; and a tower for tall trees. The bulletin describes types of equipment best fitted for this method of spraying and deals especially with nozzles, crooks, force pumps, and engines for driving the pumps.

Data are given for determining the capacity of pumps and also for selecting hand or force pumps to satisfy certain conditions, as well as a score card for rating power sprayers. A bibliography on spraying is appended.

Sanitary remodeling of dairy barns, R. S. Smith (*Bul. [Maine] Dept. Agr., 11 (1912), No. 4, pp. 15–31, figs. 12*).—This article suggests and illustrates a few changes that may be made at reasonable expense in old dairy barns to establish sanitary conditions for the cows and aid in the production of clean milk.

It is stated that the ventilation should be such as to keep the temperature of the stable down to 50° without creating drafts. Fresh air inlets should begin near the ground on the outside and end near the ceiling on the inside and should be numerous, well distributed, and of small size on all sides of the stable. Ten or 12 inlets 4 by 12 in. should be sufficient for 20 cows. Air outlets should be large and open near the floor with sufficient extension above the roof to cause a good upward draft. An outlet 2 ft. square is sufficient for 20 cows.

Each cow should be allowed 4 sq. ft. of light and the inside of the stable should be painted white or whitewashed at least once a year. Stalls and stanchions should be so constructed as to hold the cow securely, keep her clean and comfortable, and should allow convenient feeding, milking, and cleaning of refuse.

Plans and specifications for flue curing tobacco barns (*Rhodesia Agr. Jour., 10 (1912), No. 2, pp. 235–240, pls. 3*).—This is a partial revision of a pamphlet containing complete working plans and specifications, subject to modifications to suit specific cases, for a flue curing barn for the purpose of treating Virginia leaf according to the approved process for the production of bright tobacco.

The custom at present in Rhodesia is to build the furnace on the outside of the barn, but it is considered that the heat can be more economically applied if the furnaces are inside. Such a barn will take longer to cool down, but if the furnace is of moderate dimensions the difference will be but small. The inside measurements recommended are length 5 ft., width 2 ft., and height 2½ ft.

Ice house construction, W. C. DAVIDSON (*Hoard's Dairyman, 44 (1913), No. 24, pp. 731–734, figs. 12*).—This article deals with the general question of ice storage and takes up the design, construction, and cost of concrete and frame ice houses. It is stated that insulation, drainage, solidity, and shape to expose a minimum of surface are the most important points to be observed, and it is suggested that an ice house be built as nearly cubical in shape as possible, preferably all above ground to aid drainage, and that at least 18 in. be left between the ice and the side walls to allow for proper insulation packing.

Detailed working plans and bills of material are given of a 12 by 12 by 12 ft. reenforced concrete ice house with double 4 in. walls and a 6 in. dead air space insulation, and of a wooden frame ice house of the same size with double walls and a sawdust insulation. The capacity of either is 21 tons. The concrete house costs $333 and the wooden house $190, but the concrete house is considered the more durable and satisfactory in the long run.

Details pertaining to the new station poultry plant, H. R. LEWIS (*New Jersey Stas. Rpt. 1911, pp. 141–155, pls. 5, figs. 5*).—The soil and location of this plant are described, and plans are given showing the design and construction of poultry houses, including fattening, killing, and picking rooms, an incubator cellar and brooder, and laying houses. Bills of material and costs are also given. Further details are to be published later.

Thunderstorms and lightning conductors, W. M. WATT (*Rhodesia Agr. Jour., 10 (1912), No. 2, pp. 230–234, pl. 1*).—This is a report of studies of lightning action and of lightning conductors, and gives general specifications for lightning conductors on buildings.

The author claims that the height of conductor above the roof should be about 1 ft. for every 10 ft. above the ground with a minimum height of 3 ft. The conductor should be firmly connected with the ground by means of a large metal connection embedded in continually moist earth, and with all metal work of buildings by means of wire ropes.

Extinguishing fires with sawdust, E. A. BARRIER (*Engin. News, 69 (1913), No. 5, pp. 217, 218*).—The results of experiments are recorded with the use of sawdust and mixtures of sawdust and sodium bicarbonate for extinguishing fires, especially those of inflammable liquids. Three tanks were used in these tests, the flaming liquids being lacquer and gasoline, and the sawdust being applied by means of an ordinary long handled shovel.

It was found that sawdust, if spread over the surface, will readily and successfully extinguish fires of inflammable liquids when contained in moderate sized tanks or spread in small quantities on floors. The efficiency of sawdust is due to its blanketing action excluding air, and increases with the viscosity of the liquids. The character of the sawdust, whether wet or dry or from soft or hard wood, apparently does not affect its efficiency, but the admixture of sodium bicarbonate materially increases it.

Individual gas lighting plants, E. BECKER (*Canad. Thresherman and Farmer, 18 (1913), No. 1, pp. 56–60*).—This is a paper read before the American Society of Agricultural Engineers (E. S. R., 28, p. 199), in which the author gives the results of his own and other investigations and experiments with the use of gasoline gas, acetylene, and Blau gas for small lighting plants.

The results show that gasoline gas has a caloric value of about 600 B. T. U. per cubic foot, acetylene about 1,440 B. T. U., and Blau gas from 1,800 to 2,000 B. T. U. The explosive range of gasoline gas is over 20 per cent, and that of acetylene about 47 per cent, whereas that of Blau gas is only about 4 per cent. It is also nonpoisonous, ready for use without preparation or generation, and

it is claimed that its price compares favorably with those of other illuminating agents.

Farm sewage, E. M. SANTEE (*New York and London, 1912, pp. VII+32, figs. 5*).—This book deals with sanitation in farm homes, taking up the question of water supply and somewhat at length the treatment and disposal of sewage. The general theory of sewage purification in septic tanks and of disposal through absorption systems is discussed, and the essentials of the design of both are presented.

On the basis of his observations, the author states that the septic tank should be about twice as long as it is wide, and the depth should be about the same as the width. It must be water-tight, and very nearly air-tight, and should have a capacity to hold 24 hours' maximum flow of sewage. About 9 cu. ft. or 67½ gal. should ordinarily be allowed for each person in the family, but no tank should be built smaller than 6 ft. long, 3 ft. deep, and 3 ft. wide, and for families of from 7 to 10 persons 1 ft. per person should be added to the length. The disposal area should consist of 4 in. land tile, laid in a ditch 12 in. deep, with a grade not to exceed $\frac{1}{16}$ in. to the foot, and having in loose soil not less than 48 ft. of tile for the smallest tank, and about 8 ft. additional for each person beyond 6 in the family. This length should be doubled in clay soils, and in hard pan it is deemed necessary to dig a trench 3 ft. wide and 3 ft. deep, fill with gravel or cinders to within a few inches of the surface, top with soil, and lay the tile as in soil.

A detailed description of the location and construction of the septic tank and disposal area is given, with a set of common questions upon the subject and their answers.

Sewage purification in the East: Coral as a filtering material, B. BALL (*Surveyor, 43 (1913), No. 1098, pp. 198–200, figs. 6*).—The results of experiments are recorded with coke, coral, granite, laterite, and clinker broken to a 2 in. gauge with a view to determining their relative values as filtering material for the purification of sewage tank effluent. The experimental plant receiving the sewage of 200 persons daily consisted of a mixing tank, a liquifying tank, and 3 filter beds in which the materials were tested in turn.

From the first the coral filter yielded a superior effluent and it maintained its superiority over the other materials throughout the experiments, which lasted 2 years.

RURAL ECONOMICS.

Farm management, G. F. WARREN (*New York, 1913, pp. XVIII+590, figs. 117*).—This volume outlines the field of farm management as a study by defining and illustrating the various types of farm enterprises, and showing how each may be organized and managed to secure the most efficient use of capital, labor, horses, and machinery.

The author discusses and suggests methods of applying fundamental business principles to the farm to secure the greatest continuous profit. The conclusions reached and brought out in chapters with the following headings are based upon his experience as a farmer and inquiries made in various farming activities in different parts of the United States: Shall I be a farmer, types of farming, diversified and specialized farming, intensive and extensive farming, maintaining the fertility of the land, the farm management point of view on some live stock problems, size of farms, size of farms and other factors in different regions in the United States, capital, methods of renting land, farm labor, farm equipment, cropping systems, marketing farm products, farm records and

accounts, complete set of cost accounts, choice of region, choosing and buying a farm, and some successful farms.

Agriculture in New York State, A. GRÉGOIRE (*Rev. Écon. Internat., 10 (1913), I, No. 2, pp. 387–403*).—This is a summary of data from New York Cornell Station Bulletin 295 previously noted (E. S. R., 25, p. 594).

Three years of dairy farming, D. H. OTIS (*Hoard's Dairyman, 45 (1913), No. 9, pp. 341, 342*).—Notes and tables are given in this article showing amount of capital invested, interest on capital, labor income, and variation in receipts and expenses on a Wisconsin dairy farm for 3 years, with some suggested reasons for the variation in results. Data are also given showing the efficiency of labor, feed, and acres per animal unit and the animal income from each unit.

The relation of the net land revenue to the value of the land, O. MIELCK (*Fühling's Landw. Ztg., 62 (1913), No. 4, pp. 128–138, figs. 6*).—The author presents in this article results obtained and conclusions reached in a special study of the relations existing between the value of land and the net land revenue.

For example, it is shown that in Luneburg land worth 500 marks per hectare (about $48.15 per acre) in 1912 had a net revenue of 27 marks, while land worth 1,500 marks per hectare had a net revenue of 72 marks. In Potsdam, land worth 100 marks per hectare had a net land revenue of 3 marks, while the net revenue for land worth 1,000 marks was 54 marks. Diagrams are given showing corresponding results obtained in the various Provinces.

The business side of farming.—II, Practical problems in rural economics, H. MACPHERSON (*Oreg. Agr. Col. Bul. 71 [1913], pp. 87*).—This publication is one of a series of bulletins on the business side of farming, being issued by the Oregon Agricultural College, and presents the results of a study of the economic problems of agricultural production, the marketing of farm products, the problem of organized marketing, and the purchase of farm supplies.

Cooperative finance, H. MYRICK (*New York and London, 1912, pp. XXXII+327, pls. 6, figs. 125*).—The author in this volume points out and discusses some economic changes now going on, a number of which are of particular interest to farmers. He also offers suggestions as to how the American people may organize and cooperate in such a way as to encourage business, farming, home owning, individual and corporate success, social justice, and national prosperity. Charts and tables are given illustrating various economic conditions, at the same time suggesting methods for improving them.

Rural development and small holdings (*Nat. Cong. Rural Development and Small Holdings Proc. [London], 1911, pp. XII+247*).—This volume reports the proceedings of the national congress held at Crystal Palace, London, October 18–20, 1911, at which questions relating to cooperation, cooperative credit, agricultural production, equipment of small holdings, and rural education were discussed.

Rural life conference (*Alumni Bul. Univ. Va., 3. ser., 4 (1911), No. 4, pp. 329–518, pl. 1*).—This bulletin presents addresses delivered at the University of Virginia summer school in connection with the conference on the study of rural life problems, July 17–21, 1911. Many of the economic, social, educational, and religious phases of rural life are discussed.

International trade in farm and forest products, 1901–1910, E. MYRRITT (*U. S. Dept. Agr., Bur. Statis. Bul. 103, pp. 57*).—This bulletin presents a compilation of statistics showing substantially the international trade of the world for the decade, 1901–1910, in the principal farm and forest products. The following table makes comparison of the average imports and exports of agricultural products for the periods 1901–1905, 1906–1910:

Comparison of the average imports and exports in the international trade in agricultural products.

Product.	Average, 1901–1905.			Average, 1906–1910.		
	Imports.	Exports.	Exports in percentage of imports.	Imports.	Exports.	Exports in percentage of imports.
			Per cent.			*Per cent.*
Butter, lbs	590,968,570	585,094,151	99.0	638,743,786	645,231,193	101.0
Cheese, lbs	484,269,073	480,081,180	99.1	518,754,194	506,768,600	97.7
Coffee, lbs	2,442,718,454	2,493,581,122	102.1	2,642,005,117	2,698,421,102	102.1
Corn, including corn meal, bu	235,835,231	221,067,433	93.7	235,223,859	234,064,095	99.5
Cotton, raw, bales	10,937,752	11,015,217	100.7	12,612,941	12,455,424	98.8
Cottonseed oil, galls	49,753,991	47,868,093	96.2	50,603,487	49,915,573	98.6
Hides and skins, lbs	1,320,060,397	1,313,517,994	99.5	1,676,462,302	1,660,662,898	99.1
Hops, lbs	55,790,879	55,721,572	99.9	62,175,929	62,921,031	99.8
India rubber, crude, lbs	173,449,930	163,185,596	94.1	235,518,421	216,422,693	91.9
Oil cake and oil-cake meal, lbs	4,323,962,819	4,256,574,116	98.4	5,293,788,860	5,102,458,317	96.4
Rice, lbs	9,683,172,170	10,561,683,306	109.1	10,541,953,311	11,025,467,260	104.6
Rosin, lbs	802,612,633	873,806,457	108.9	827,500,915	860,147,194	103.9
Spirits of turpentine, galls	24,688,171	23,710,313	96.0	27,279,193	25,132,401	92.1
Sugar, lbs	11,509,269,054	11,879,902,524	103.2	12,980,603,406	13,623,844,657	105.0
Tea, lbs	606,727,547	635,118,251	104.7	734,243,998	727,877,995	99.1
Tobacco, lbs	668,267,097	726,377,597	108.7	733,335,412	808,749,753	110.3
Wheat, bu	468,253,208	482,806,047	103.1	511,885,685	541,657,530	105.8
Wheat flour, bbls	23,979,526	24,374,165	101.6	23,692,846	24,746,221	104.4
Wheat, including wheat flour, bu	576,161,076	592,489,790	102.8	618,503,494	653,015,524	105.6
Wood pulp, lbs	2,531,881,308	2,455,606,665	97.0	3,784,160,941	3,762,681,703	99.4
Wool, lbs	1,846,004,358	1,682,240,054	91.1	2,169,951,858	1,957,327,181	90.2

Other tables are given showing comparable statistics of imports and exports of various farm products by countries and for different periods.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 15 (1913), No. 3, pp. 17–24, figs. 11*).—This publication reports that the amount of wheat on farms March 1 was about 156,483,000 bu., or 21.4 per cent of the 1912 crop, against 122,025,000 bu. on farms at the same time last year. Similar data are given for corn, oats, and barley.

The money wages of farm labor in the United States are shown to have increased 3.2 per cent during the past year and 7 per cent during the past 2 years.

Notes and tables are given showing the value in 1912 of crops reported quantitatively by the Department with comparisons; crop report for March, 1913, by States, with comparisons; temperature and precipitation statistics; per capita wheat consumption in various countries; prices to producers of farm products on dates indicated; monthly receipts and stocks of butter and eggs; wheat stocks in mills and elevators; wages of farm labor; "world" crop production and range of prices of agricultural products at important markets; together with charts illustrating the seasonal fluctuations in prices of farm products.

AGRICULTURAL EDUCATION.

Making agricultural colleges more useful, A. N. Hume (*Farm and Fireside, 36 (1913), No. 8, p. 4*).—The author briefly describes a plan of organization under which the administrative head of the entire agricultural work is the dean and director, assisted by a superintendent of extension work.

How the Iowa state colleges are getting together, W. R. Boyd (*Amer. Rev. of Reviews, 47 (1913), No. 2, pp. 209–211*).—This article reviews the status in Iowa of its 3 separate state institutions for higher education, and presents reasons for the recent changes proposed by the State Board of Education.

The redirection of the rural school, W. R. Hart (*Jour. Ed. [Boston], 77 (1913), No. 4, pp. 89, 90, fig. 1*).—In proposing that the aims and energies of the rural school be redirected, two main purposes, according to this article, should be kept in mind. First and foremost is the purpose of keeping before the minds of the young the leading elements of rural life. These are made up of "the rural industries, rural recreations, rural civics, rural church life, and rural home life." The second purpose should be to furnish instruction that grows out of and is connected with the various lines of rural industries and rural homes.

The course of study and the equipment for carrying on the work of such a redirected rural school are outlined.

Boys and girls learn to do by doing (*New England Homestead, 66 (1913), No. 8, pp. 3, 4, figs. 2*).—In this article the home-projects system of instruction in agriculture, as conducted in Massachusetts (E. S. R., 28, p. 106), is described and notes given on some striking instances of successful work.

The possibilities and limitations of nature study in the public schools, H. H. Cleaves (*Proc. Staten Isl. Assoc. Arts and Sci., 3 (1910–11), No. 3, pp. 123–127*).—In this paper the author discusses the relative advantages of the city, suburban, and country schools in securing nature-study material.

Junior Agricultural Association of Michigan for boys and girls, R. L. Nye (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 10, 1912, pp. 23, figs. 5*).—This bulletin is intended as a guide for the formation of boys' and girls' agricultural clubs, and contains a suggestive constitution, general suggestions on club meetings, and outlines of projects.

Some results of the boys' corn-club work in South Carolina, C. B. Haddon (*South Carolina Sta. Circ. 7, pp. 28, figs. 4*).—Several letters incorporated in this circular give an idea of the educational value of the boys' corn club as viewed by prominent educators of the State. Since the work began in 1909 the acreage in corn in the State has increased from 1,565,832 to 1,790,000 acres, and the average yield from 13.3 to 18.2 bu. per acre. Instructions on forming clubs and other data are given.

Farmers' institutes, J. Hamilton (*Business America, 13 (1913), No. 1, pp. 47–50*).—In this paper the author deals briefly with the origin and support of farmers' institutes, calls attention to the establishment of a farmers' institute service in the U. S. Department of Agriculture, and enumerates some of their many achievements, including their effect upon education, the general interest they have aroused in agriculture, and the effect they have had upon the attitude of farmers toward their business.

An educational record in the Empire State, E. Van Alstyne (*Business America, 13 (1913), No. 1, pp. 55–59*).—The director of farmers' institutes in New York State here directs attention to specific instances of educational advancement resulting from the work of farmers' institutes.

The educational value of the grange, Jennie Buell (*Business America, 13 (1913), No. 1, pp. 50–54*).—This discussion deals mainly with the direct educational influence of the grange upon its members in training for leadership.

Women's institute work in British Columbia (*Brit. Columbia Dept. Agr. Bul. 43, 1912, pp. 43*).—This bulletin is the first publication issued by the Advisory Board of Women's Institutes, and deals with the growth and expansion of this organization since its inception a year ago. Its function is to advise and confer with the Department of Agriculture on matters relating to

women's institutes and women in agricultural pursuits and to do such special work as the deputy minister may direct.

[Report of the Macdonald Consolidated School, Hillsboro, for 1910], G. LE LACHEUR (*Ann. Rpt. Macdonald Consol. School, P. E. Island, 1910, pp. 16, figs. 8*).—A report on the development of this school in the 5 years since its establishment, and on its activities, including instruction in nature study, school gardening, and household science for the year ended June 30, 1910.

Agricultural education in Grenada, with special reference to the boys' secondary school, D. H. JONES (*West Indian Bul., 13 (1912), No. 1, pp. 55–63*).—The author reviews various unsuccessful attempts made to introduce rural teaching into the Grenada elementary schools, and discusses a movement now on foot to equip a good secondary school for the needs of the island. A one-quarter acre plat in the botanical gardens has been placed at the disposal of the school, and divided into subplats, for which each agricultural pupil will in turn be made entirely responsible.

The need for higher agricultural education in the West Indies, A. FREDHOLM (*West Indian Bul., 13 (1912), No. 1, pp. 64–80*).—The author calls attention to the importance and benefits of agricultural education and gives data showing that agriculture is as remunerative in the West Indies as are other vocations.

Piracicaba and its agricultural school, M. DE SAMPAIO FERRAZ (*Piracicaba e sua Escola Agricola. Brussels, 1911, pp. 125, pls. 16, figs. 29*).—This includes a historical review and an account of the organization, equipment, and instruction of the Luis de Queiroz School of Agriculture at Piracicaba, Brazil.

Polytechnic School of S. Paulo, Brazil: Historical résumé of the school, edited by F. F. RAMOS (*École Polytechnique de S. Paulo, Brésil: Résumé historique de l'école. Anvers, [1909], pp. 63, pls. 19*).—A historical review of the development of this school.

The history of the development of instruction in connection with the poultry industry in Ireland, J. S. GORDON (*Dept. Agr. and Tech. Instr. Ireland Jour., 13 (1912), No. 1, pp. 51–59*).—A paper read at the meeting of the International Association of Poultry Instructors and Investigators held in London, July 18–24, 1912, describing the progress of the work since 1892.

Report on farm and agricultural schools and colleges in France, Germany, and Belgium (*Bd. Ed. [London], Ed. Pamphlet 25, 1912, pp. 25*).—In this report a representative of the Board of Education of Great Britain has arranged the agricultural institutions visited by him in 1911 in the following 6 classes: (1) Farm schools situated on farms, (2) winter and short-course schools with no farm, (3) long-course schools with no farm, (4) secondary schools giving instruction in agriculture with a farm, (5) schools of practical agriculture with farms, and (6) agricultural colleges. An account is also given of a Swedish agricultural school visited in 1909, and of an Australian agricultural school inspected in 1910. In conclusion he makes some observations as to the feasibility of the adjustment of some of these types of institutions to English conditions.

Professional agricultural instruction for farm women in Belgium, Mrs. HAENTJENS-DELEU (*Jour. Agr. Prat., n. ser., 25 (1913), Nos. 3, pp. 81–83; 5, pp. 147–149*).—An account is given of the aim and organization of itinerant agricultural home economics schools and farm women's clubs or cercles. From 1909 to 1911 there were 79 itinerant schools and 1,221 diplomas were awarded. There are at present 140 farm women's clubs.

Agricultural instruction [in the Province of Saxony] (*Landw. u. Landw. Kam. Prov. Sachsen, 1906–1910, pp. 65–72*).—A review of progress made in the 5 years from 1906 to 1910 in the various phases of agricultural instruction in

charge of the Chamber of Agriculture of the Province of Saxony. It is shown that the attendance at the 12 agricultural winter schools increased from 454 to 645; at the Meadow Culture School at Schleusingen, from 56 to 80 in the summer terms, and from 65 to 86 in the winter terms; at the 5 agricultural housekeeping schools, from 200 to 248. The number of itinerant courses increased from 907 to 1,120.

Lower agricultural schools in Prussia, E. G. COOLEY (*Farmers' Rev., 45 (1913), No. 2, pp. 24, 31, 39, fig. 1*).—The author gives an account of the lower schools of Prussia which undertake to provide technical agricultural instruction and training as well as some general training for the sons of small farmers.

These schools may be divided into two classes, viz, farm schools and agricultural winter schools. The farm school presupposes that the boy has completed the elementary school and undertakes to give him an efficient agricultural training in a 1½ to 2 year course, requiring his attendance throughout the year. The school usually possesses a piece of ground on which the students do actual farm work. The agricultural winter school, which is under the management of the chamber of agriculture of the district and representative men, offers both general and technical elementary instruction during two winter courses of from 5 to 6 months' duration, and utilizes the services of the itinerant agricultural instructor.

The number of farm schools has diminished since 1876 from 26 to 17, while the number of winter schools has increased from 12 to over 200. The attendance of the farm schools was 111 in 1908–9, while that of the winter schools was 7,273. The course of study of an agricultural winter school is outlined, but these courses vary somewhat, being adapted to local conditions.

Brief descriptions are also given of the work of the itinerant instructors outside of the schools and of the work of the permanent, itinerant, and continuation housekeeping schools for women and girls, and of the country continuation schools which give practical instruction in agriculture in the evening. These schools have been made compulsory in two of the Provinces of Prussia.

Report on the Royal Horticultural Institution at Dahlem, near Berlin-Steglitz, for 1910 and 1911, T. ECHTERMEYER (*Ber. K. Gärt. Lehranst. Dahlem, 1910–11, pp. 138, figs. 32*).—This is a report on the attendance, courses of study, admission requirements, etc., and the technical and scientific activities of the institution.

Hungarian Forestry School, Selmeczbanya, F. STORY (*Quart. Jour. Forestry, 7 (1913), No. 1, pp. 30–32*).—Notes on the organization of the school.

The agricultural department of the Gold Coast Colony: Short history of its institution and development, W. S. D. TUDHOPE (*Accra, Africa [1911], pp. 41*).—Following the history of the department, an account is given of its work, including (1) the introduction, propagation, and distribution of plants and seeds of economic products, (2) research work, and (3) educational work—publications, training of apprentices, and classes in agriculture for school teachers and others at the 4 agricultural stations in the colony and Ashanti, and school gardens.

The Colonial School of Agriculture of Tunis, 1912 (*Bul. Agr. Algérie et Tunisie, 18 (1912), No. 20, pp. 469–478*).—An account of the organization, development, and present status of this school.

Soils and soil fertility, A. R. WHITSON and H. L. WALSTER (*St. Paul, 1912, pp. 315, figs. 51*).—The explicit language of this book and the avoidance of complicated scientific data and technical terms make it especially adapted for use in high-school courses in agriculture and short courses in colleges. A set of simple, easily carried out laboratory exercises and demonstrations, with directions, is also included.

Course in geology for agricultural teachers, 1911, A. JENTZSCH (*Landw. Jahrb., 42 (1912), No. 3, pp. 365–414*).—This is a detailed report of the instruction given annually by the Prussian Geological Institute in a three weeks' course in geology for agricultural teachers. The object is to give them a thorough understanding of geological maps in their relation to agriculture.

What should be the aims of instruction at horticultural continuation schools? F. ZAHN (*Möller's Deut. Gärt. Ztg., 28 (1913), Nos. 2, pp. 20–22; 3, pp. 34, 35*).—The author outlines 3 years of instruction in horticulture in continuation schools for students from 14 to 17 years of age. Three hours are devoted to this instruction, 2 to drawing and 1 to parallel technical questions. He recommends that the instruction be made obligatory and that all subjects of the course be closely correlated with horticultural practicums.

Woodman's certificate and forester's diploma of the English Arboricultural Society (*Quart. Jour. Forestry, 7 (1913), No. 1, pp. 37–42*).—General conditions and regulations for the examinations for the woodman's certificate and forester's diploma, to "meet the requirements of foresters and others who might desire to secure recognition of their practical and scientific attainments in forestry and in the elements of sciences underlying their profession," are given.

Beginnings in animal husbandry, C. S. PLUMB (*St. Paul, 1912, pp. 393, pl. 1, figs. 216*).—This book is especially designed to meet the needs of students in animal husbandry courses in secondary schools. Among the subjects discussed are breeds of horses, cattle, sheep, swine, and poultry; reasons and methods in judging live stock; judging horses, cattle, sheep, swine, and poultry; feeding standards, origin and use; and how to calculate a ration. Topics for discussion and suggestions for observation and application are included at the close of each chapter.

Educational work, H. R. LEWIS (*New Jersey Stas. Rpt. 1911, pp. 135–140*).—An outline of a poultry reading course for the use of existing local organizations is given, together with a suggestive constitution and by-laws for county poultry associations.

Household science and arts for elementary schools, JOSEPHINE MORRIS (*New York, Cincinnati, and Chicago [1912], pp. 224, pls. 4, figs. 2*).—In this 2-year course, the author offers suggestions as to the best ways of keeping a house clean and sanitary, gives advice in regard to the care and preparation of wholesome foods, and formulates about 350 recipes.

Outline for course in domestic science, PEARL MILLER (*Col. Courier [N. Mex. Agr. Col.], 1 (1913), No. 2, pp. 3, 4*).—Each of the 24 lessons outlined in this 2-year course, prepared for the public schools of New Mexico, consists of a talk by the teacher on which the pupils should be required to take notes, and an assignment of practice work to be done by the class. A list of domestic science equipment for rural schools is appended.

Housekeeping and cooking lessons for rural communities, AMELIA A. COOKE (*Hampton Leaflets, 6 (1913), No. 9, pp. 38*).—These lessons in housekeeping and cooking are offered as suggestions from which the teacher can arrange the work to meet the needs of her particular community.

The school garden, A. LOGAN (*Aberdeen: North of Scot. Agr. [1911], pp. 47, pls. 6, figs. 2*).—Notes on the method followed in the making and management of a school garden at the college demonstration garden, Huntly, and the educational value of such a garden, are presented.

Yearbook of rural economy, 1913, edited by H. C. LARSEN (*Landökonom. Aarbog [Copenhagen], 14 (1913), pp. 127*).—A complete annual directory of the public institutions and associations for the promotion of Danish agriculture in its various branches. A list of periodicals published in Denmark is appended.

List of agricultural fairs and exhibitions in the United States, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 102, pp. 68*).—A total of 2,740 societies holding regular fairs and exhibitions in 1912 is listed by States. Of these 1,647 are classified as devoted to general agriculture, 80 to horticulture, 13 to floriculture, 4 to corn, 22 to live stock, 81 to horses, 801 to poultry, pigeons, and pet stock, 74 to dogs, 1 to apiculture, and 7 to dairy products.

MISCELLANEOUS.

Twenty-fifth Annual Report of Alabama College Station, 1912 (*Alabama Col. Sta. Rpt. 1912, pp. 45*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, and reports of the director and heads of departments on the work and publications of the station during the year.

Annual Report of New Jersey Stations, 1911 (*New Jersey Stas. Rpt. 1911, pp. XXII+582, pls. 60, figs. 22*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1911, and for the College Station for the fiscal year ended June 30, 1911, a brief report by the director, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. Reports have been previously noted on the inspection of fertilizers (E. S. R., 26, p. 819), and on feeding stuffs (E. S. R., 25, p. 774). The report of the animal husbandman includes records of the dairy herd for the year.

Twenty-third Annual Report of Tennessee Station, 1910 (*Tennessee Sta. Rpt. 1910, pp. 91–122, figs. 9*).—This contains the organization list, reports of the director and the various departments, the experimental features of which are for the most part abstracted elsewhere in this issue, a financial statement for the fiscal year ended June 30, 1910, and a list of the station bulletins issued from 1888 to 1910.

Twenty-second Annual Report of Washington Station, 1912 (*Washington Sta. Bul. 109, pp. 24*).—This contains the organization list, a report of the work and publications of the station during the year, and a financial statement for the fiscal year ended June 30, 1912.

Annual report of the director of the experiment station on work done under the Local Experiment Law in 1911, J. F. DUGGAR (*Alabama Col. Sta. Circ. 19, pp. 131–154*).—This includes a report by the director of the station on the organization of work under the Local Experiment Law of 1911 (E. S. R., 24, p. 400) and its progress during 1911, a financial statement for the year, and brief reports by heads of departments as to their activities.

Annual report of the director of the experiment station on work done under the Local Experiment Law in 1912, J. F. DUGGAR (*Alabama Col. Sta. Circ. 20, pp. 40*).—The text of the law is given and data corresponding to that for the previous year (see above) are reported for the year 1912. A detailed account of the work of the boys' corn clubs and girls' tomato clubs is included.

Needed appropriations for the Texas Agricultural Experiment Stations, B. YOUNGBLOOD (*Tex. Expt. Stas. Assoc. Pub. 2 [1912], pp. 15, figs. 5*).—The needs of the Texas Stations are set forth in detail.

Experiment Station Work, LXXIII (*U. S. Dept. Agr., Farmers' Bul. 522, pp. 24, figs. 3*).—This number contains articles on the following subjects: Soils for alkali water, importance of draining wet soils, marrow cabbage, feeding beef cattle in the South, town and country poultry raising, cost of producing milk, milk-powder starters in creameries, sheep-branding paints, and cooperation among fruit growers.

NOTES.

Hawaii Federal Station.—The territorial legislature has appropriated $30,000 for the next biennium to enable the station to develop substations on the various islands and assist in the marketing of local products. Three new substations are to be established, two on Hawaii and one on Maui, and an effort will be made to organize immediately under cooperative associations the farmers in the various parts of the Territory for the purpose of facilitating the marketing of their products.

Idaho University.—Dr. J. M. Aldrich, professor of biology, has accepted a position with the Bureau of Entomology of this Department.

Michigan Station.—E. T. Hall has been appointed research assistant in bacteriology, and has entered upon his duties.

Minnesota University and Station.—Appropriations aggregating $3,290,450 were granted by the legislature. Of this $326,000 is for special agricultural maintenance, $639,950 for buildings and equipment, and $276,500 for agricultural substations.

A seed testing laboratory is to be opened at the college of agriculture July 1, under the provisions of a seed labeling law just enacted, with W. L. Oswald in charge and Robert C. Dahlberg as seed analyst. An appropriation of $5,000 per annum is available for the work.

The new agricultural engineering building is nearing completion and is expected to be ready for occupancy next fall.

Recent appointments include Dr. Frederick J. Alway, head of the department of agricultural chemistry of the Nebraska University and Station, as professor of soil chemistry and chief of the division of soils; Miss Josephine T. Berry, head of the department of home economics at the Washington College, as professor of nutrition and head of the department of home economics; George A. Works as assistant professor, and E. C. Davis as instructor in agricultural education; Richard Wellington, associate horticulturist of the New York State Station, as assistant professor of pomology and assistant horticulturist, vice A. R. Kohler resigned; Louise McDanell, assistant professor of foods and cookery at the Washington College, in a like capacity; Grace I. Williams as instructor in food and cookery; and Frank E. Balmer as district supervisor of the county agricultural service. Oscar M. Olson, in charge of farm demonstration work, and Ella C. Pine and Alice Harmon, instructors in domestic science, have resigned.

Montana Station.—E. L. Currier, a graduate of the Nebraska University, has been appointed in charge of the farm management department, and has entered upon his duties.

Nevada University and Station.—E. A. Howes, professor of agronomy and agronomist, has resigned to take charge July 1 of a demonstration farm established by the Canadian Department of Agriculture near Vermilion, Alberta.

Nebraska Station.—Clayton O. Rost and Guy R. McDole have been appointed assistants in agricultural chemistry.

Ohio State University and Station.—The appropriations thus far granted to the university by the legislature aggregate $371,730, an increase of $64,855 over

the corresponding items for the previous year. Among the allotments are $75,000 toward a horticulture and forestry building, $75,000 for a botany and zoology building, $20,000 for apparatus and equipment, $10,000 of which is for the library, $3,000 for milk testing work, and $5,500 for improvement of grounds and fire protection.

An arts agricultural course of 5 years has been established. Students will be registered in the arts college the first 3 years and the remainder in the college of agriculture. At the end of the fourth year they will receive the degree of bachelor of arts and at the end of the fifth that of bachelor of science in agriculture.

A law just enacted by the legislature establishes an agricultural commission of 4 men, to be appointed by the governor, to take over the duties of the board of control of the station, the state board of agriculture, the state dairy and food commission, the state fish and game commission, and in large measure the state pharmacy board.

J. H. Muncie has been appointed assistant in botany at the station and has entered upon his duties.

Oklahoma College.—The college is to locate and operate five encampment schools during the summer. Each of the five supreme court judicial districts will have an opportunity to secure one of these "tent" schools, and the location within the district will be determined by a contest between the counties as to their relative advantages as regards the county farmers' institute and its woman's auxiliary and the boys' and girls' agricultural clubs organized under the direction of the college. The college will furnish two tents, lecturers, live stock, and other equipment, and the course in each case will be for one week.

Texas College and Stations.—William Harper Dean, instructor in entomology and assistant entomologist, resigned April 1.

Utah College and Station.—The legislature has appropriated $55,000 for a chemical building, $29,500 for a new heating plant, and $2,500 for a shed for farm machinery work. The Branch Normal School, located at Cedar City, has been transferred from the control of the state university to that of the college, and its work changed to agriculture and domestic science. Small appropriations were made for improvements at this institution.

The admission requirements of the college, beginning with the year 1914, will be 15 units. A group elective system will be substituted for the present courses.

The extension department has closed a very successful year. The annual roundup at Logan enrolled 305 students in agriculture and 117 in home economics, and one for the south central portion of the State at Richfield had an enrollment of 367 in agriculture and 177 in home economics. Short course schools and one and two day institutes have been held in various parts of the State with a total enrollment of 62,000. A live stock train run on the Salt Lake route attracted an attendance of 9,160.

The home economics work of the college has been divided into departments of dietetics, domestic arts, and household sanitation. C. W. Porter, assistant professor of chemistry, has been made director of the school of home economics.

Dr. C. N. Jensen, professor of botany and plant pathology and plant pathologist, has resigned to accept the presidency of Brigham Young College, and will be succeeded by George R. Hill, Ph. D. (Cornell, 1912), now connected with the Missouri Botanical Garden. Dr. Hill will have as assistants J. I. Lauritzen and Bert L. Richards, of the class of 1913.

W. Ernest Carroll, associate professor of animal husbandry and animal husbandman, has been granted leave of absence for a year's postgraduate study. His work will be taken by Clauson Y. Cannon, of the class of 1913. Other ap-

pointments from this class include W. W. Knudson as instructor in horticulture and assistant horticulturist, vice Howard Schweitzer, resigned; George Stewart and Herman Stucki as assistant agronomists, vice A. E. Bowman, resigned to take up farm demonstration work; and Howard Maughan as fellow in agronomy.

Virginia Truck Station.—Frank Lindsay, of Norfolk, has been appointed a member of the governing board, vice N. W. Nock, resigned. J. C. Westcott has been appointed horticultural foreman, vice J. E. Pickett, resigned.

Sixth Graduate School of Agriculture.—The sixth session of this school is to be held in July, 1914, at the college of agriculture of the University of Missouri.

Imperial Bureau of Entomology.—This bureau has been definitely organized under the financial support of the British Government and its various dominions and colonies. It supersedes the Entomological Research Committee appointed in 1909, this body now becoming an honorary committee of management of the new bureau, with the Earl of Cromer as its president and scientific secretary. Guy A. K. Marshall has been appointed director of the bureau and editor of the *Review of Applied Entomology*, established in January and being published monthly in two parts, Series A dealing with agricultural entomology and Series B with medical and veterinary entomology.

In addition to the publication of this journal the functions of the bureau are announced as including the making of a general survey of the noxious insects of the world, the collection and coordination of information relating thereto, and the authoritative identification of insects of economic importance when submitted by the departments of agriculture and public health of the British Empire. It will also continue the publication of the *Bulletin of Entomological Research.*

State Aid to High Schools and Normal Schools.—An act was passed by the Arizona legislature of 1912 providing $2,500 state aid to any high school or normal school having satisfactory equipment and location to give elementary training in agriculture, mining, manual training, home economics, or other vocational pursuits. The state funds are to be used in the employment of instructors in such subjects, and to provide books, charts, apparatus, models, chemicals, and other articles and materials for the equipment of classrooms and laboratories.

County Agricultural Schools in Massachusetts.—According to the *Rural Educator* for March, steps are being taken to establish two county agricultural schools in Massachusetts during the coming year. Essex County, by popular vote, has authorized the issue of $75,000 in bonds for the construction of a school plant, and $25,000 per annum for running expenses. Bristol County has authorized the issue of bonds for $30,000 for buildings and equipment.

School Gardens.—According to a recent issue of the *American School Board Journal*, 9 garden centers are being operated in Philadelphia with ground divided into individual, class, and sample plats, where the theory and practice of gardening is taught. Of individual plats, 877 were cultivated during 1912, with a total attendance in the gardens during the summer of 92,735.

Besides these school gardens, over 8,000 home gardens were planted under the supervision of the teachers. The majority of these were visited by teachers from one to four times. From these, as well as from the 50 gardens in school yards, material is furnished for nature study and drawing, and for seeds, plants, flowers, and vegetables to supply the homes.

Provision for school gardens has been included in the budget for the schools of Minnesota next year. An appropriation of $2,500 was made for the purpose.

A school gardening department was opened in the schools of Jackson, Tenn., the first of January. Regular classroom instruction is given and also practical

work in gardens in back yards and vacant lots which have been secured for the purpose.

A teachers' course in gardening is being offered this year by the University of Cincinnati for the first time.

Excluding a special grant of $729 for tools, the total amount disbursed in 1911–12 for school gardens in Jamaica was $5,915, as compared with $3,625 the preceding year. The agricultural instructors of the Jamaica Agricultural Society are devoting increased attention to the school gardens in their districts.

Conference for Education in the South.—The sixteenth conference of this organization, held at Richmond, Va., April 15–18, appealed to all classes of the community, special meetings being given for farmers, business men, preachers, editors, college women, and school workers. Its keynote was cooperation for the betterment of rural community life. Much attention was given to various kinds of cooperative organizations among farmers, also to the work of school supervision and farm demonstration.

Nothing could be more illustrative of the tendency in southern schools toward industrial education than the exhibits incident to the conference. Instead of the preponderance heretofore noted of writing, drawing, and classical samples of students' work the exhibits were made up mostly of examples of pupils' handiwork in canning, cooking, sewing, furniture making, house building, corn raising, etc. Almost everything which would be of use to the boy or girl in his or her industrial life was shown by the exhibits to be taught in the public schools.

Advocacy of making boys' and girls' club work a part of the regular school curriculum was the long forward step taken at one of the meetings of the conference. A suggestive plan was outlined by which this may be accomplished.

One day was devoted to working out plans for a system of agricultural extension work adapted to the rural communities of the South. The purpose of this particular meeting was to perfect a program which will enable colleges of all types to reach the farms, as well as the homes, schools, and churches in the country. Brief reports were given by men actively engaged in extension work in the South on how better methods of cultivation are taught, how farm management is affected, how clubs are organized, how demonstrations are conducted, how better methods of cooking are suggested, and how the home is made more comfortable, sanitary, and attractive.

Miscellaneous.—The fourth International Rubber and Allied Industries Exhibition and the first International Cotton, Fibers, Tropical Products and Allied Industries Exhibition are to be held in London in June, 1914, under the patronage of King George V. Wyndham R. Dunstan, director of the Imperial Institute, is president of the section of cotton, fibers, etc.

The corner stone of the new building of the agricultural department of Armstrong College, Newcastle-upon-Tyne, was laid April 5 by Dr. C. Stephenson, donor of $25,000 toward its erection.

Dr. K. C. Babcock, specialist in higher education in the United States Bureau of Education, has been appointed dean of the college of liberal arts and sciences of the University of Illinois.

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EXPERIMENT STATION RECORD.

VOL. XXVIII. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Review of physiological chemistry, E. LAMBLING (*Rev. Gén. Sci., 23 (1912), Nos. 15, pp. 586–596; 16, pp. 626–637*).—This is a review of the more recent literature on physiological chemistry. It deals with the pure and analytical chemistry of the proteins, partial and complete hydrolysis and its products, carbohydrates, digestion and absorption of foods, reconstruction of proteins after digestion, and the degradation of proteins and the synthesis of amino acids in the tissues.

Photochemical lecture experiments of plant physiological interest, O. BAUDISCH and E. MAYER (*Ber. Deut. Chem. Gesell., 45 (1912), No. 9, pp. 1771–1775; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 598, II, p. 750*).—"When aqueous solutions of potassium nitrate are exposed in a flat dish to the rays of a mercury lamp, oxygen is very soon liberated. This is made visible by the addition of a little starch and potassium iodid, a blue coloration being produced in from 5 to 10 seconds. The interposition of a glass plate delays the change for 20 minutes. The same change also takes place in sunlight. By interposing various solutions, the influence of light of different wave lengths on the rate of elimination of oxygen can be measured.

"Aloin, which becomes red, may also be used to detect the liberation of oxygen; this reagent is also applicable to show the elimination of oxygen from nitrites, and also from aliphatic and aromatic nitrocompounds, a process which takes from 2 minutes' exposure with nitromethan to some 17 minutes with nitrobenzene. The aliphatic nitrocompounds when exposed to light with ortho, meta, and p-phenylenediamin give the same color reactions as the aliphatic aldoximes, from which it is assumed that the nitrocompounds are partly converted into these. These color reactions given by the aldoximes are due to labile intermediate compounds formed during the Beckmann rearrangement into the corresponding acid amids."

Some tests with a precipitating serum from the protein of the sunflower (Helianthus annuus), B. GALLI-VALERIO and M. BORNAND (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 15 (1912), No. 2–3, pp. 229–237*).—With the protein from sunflower seeds it is possible to prepare a specific precipitating serum, but it has a smaller and slower precipitating power than the serum prepared from other plants of the same family. Sunflower-seed oil can not be detected with this method.

The properties of phytin (preliminary note), M. A. JEGOROW (*Biochem. Ztschr., 42 (1912), No. 6, pp. 432–439*).—Instead of using the term phytin the author believes that it would be more proper to speak of phytins because we

know very little of the nature of these compounds. The phytins from various sources (commercial, corn, oat, barley, and rice bran) show a decidedly different composition as regards their mineral constitutents. In these experiments, which were made with the commercial preparation, either purified or Starkenstein; calcium and magnesium phytates, each prepared from the commercial preparation; a phytin prepared from corn bran; and phytin from hemp seed, it was found that all of the preparations were soluble with difficulty in water, but readily soluble in dilute acids. The various preparations showed differences, however, with an acid ammonium molybdate solution. The commercial phytin gave a yellow precipitate very readily with this reagent while the calcium preparation obtained from the same source gave no precipitate, even after standing for 2 or 3 months.

Heating increased the amount of precipitate in the first case, but had no influence in the latter. The magnesium phytin at first yielded a slight yellow color precipitate with the molybdate, but this increased gradually until a voluminous whitish precipitate was obtained. Corn and hemp phytins also showed some difference with the molybdate reagent. Drying phytin produced an increase in the phosphorus precipitated by acid ammonium molybdate solution, and this increase was not dependent upon the temperature employed. Some tests on drying phytin in the air and indifferent gases showed that phytin is very easily oxidized. Oxidation tests were also made with hydrogen peroxid.

Commercial phytin can be separated into 3 fractions by dialysis, first the insoluble portion in the dialyzer, second, the fluid portion remaining in the dialyzer, and third, the diffusate. The chemical properties of each are discussed.

Although it can not be said that commercial phytin contains inorganic phosphorus, it can be definitely stated that no inorganic phosphates in phytin can be separated from the organic with the molybdate method. No good ground seems to exist for the assumption that the presence of an enzym phytase is responsible for the cleavage described above. Phytin is very easily saponified.

The fermentative cleavage of cellulose, H. Pringsheim (*Hoppe-Seyler's Ztschr. Physiol. Chem., 78 (1912), No. 3–4, pp. 266–291; abs. in Zentbl. Expt. Med., 2 (1912), No. 6, pp. 251, 252*).—The capacity for dissolving cellulose has heretofore been ascribed to micro-organisms alone. The work here reported has particularly to do with the hydrolytic cleavage by means of enzyms.

In a normal cellulose fermentation, pure cleavage products of polysaccharids were never noted, and the process always went on further to the point of forming methan, hydrogen, carbon dioxid, the lower fatty acids, and nitrogen, depending upon the kind of micro-organism which was present. The hydrolytic cleavage was accomplished by first allowing the micro-organism to begin fermentation and then to check this fermentation by adding an antiseptic. Iodoform in acetone was the most appropriate antiseptic. By checking the fermentation during the intermediate stages, sugar was detected.

The separation of bacterial fermentation and hydrolysis could also be accomplished by varying the temperature. The temperature requirements for cellulose decomposing bacteria lies around 37° C., and that of the thermophilic bacteria around 55°, while cellobiose has its optimum at 46°. The range of activity of cellobiose lies between 20 and 70°.

If a strongly fermenting thermophilic culture is taken from the thermostat, regulated at 55°, the fermentation ceases immediately, but the real enzymic hydrolytic process continues to sugar production. Among the sugars, disaccharids could only be noted with difficulty.

Cellulose is probably an endoenzym.

Autolysis of mold cultures, A. W. Dox and L. Maynard (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 227–231, figs. 3; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 20–21, p. 861*).—By growing mold fungi upon suitable substrata, a turgescent growth occurs after a period of from one to two weeks. If these cultures are allowed to stand for a few weeks longer, the turgescence vanishes and by simply shaking the flask the mycelium disintegrates. The reason for this is probably that the cell structure undergoes autolysis.

Mold fungi assimilate the greatest amount of nitrogen during the first two weeks of their growth, but return it to the culture medium in the shape of ammonia. In six or seven weeks the equilibrium is restored and the nitrogen content of the medium becomes constant. *Aspergillus niger* returns about three-quarters of its assimilated nitrogen, chiefly in the form of ammonia, to its medium.

The excretion of cytase by Penicillium pinophilum, K. F. Kellerman (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 118, pp. 29–31, figs. 2*).—"The biological activities of several species of bacteria and molds are usually considered a satisfactory explanation of the destruction of the greater portion of the cellulose annually deposited upon the soil, yet the existence of true cellulose-dissolving enzyms or cytases even now is questioned." In order to decide upon a method for determining the accuracy of these statements, a culture medium consisting of amorphous cellulose (prepared by dissolving Swedish filter paper in Schweitzer's reagent, precipitating with dilute hydrochloric acid, and washing by decantation in several changes of hydrochloric acid, and later with water until tests for copper or chlorin are no longer obtained), 5 gm.; agar, 10 gm.; potassium phosphate, dibasic, 0.5 gm.; magnesium sulphate, 0.5 gm.; sodium chlorid, 0.5 gm.; ammonium sulphate, 1 gm.; calcium carbonate, 1 gm.; and tap water, 1,000 cc., was prepared.

Tubes containing this medium inoculated with a 28-day-old culture of *P. pinophilum*, and kept in a moist atmosphere from 20 to 40 days at a temperature of 30° C., show a clear zone in the upper layers of the tubes. Sections of the cellulose agar culture may then be cut with the aid of a sterile knife for the purpose of exposing the different zones of the culture to cellulose agar plates in Petri dishes. The removal of the cellulose agar culture from the tubes is best done by scratching the tube near its bottom with a file or diamond glass cutter and then breaking the tube. In the Petri dishes it will be observed that the cytase will diffuse slowly from the sections into the substratum, and at a temperature of 30° the clarifying action is usually noticeable within 72 hours.

From the work and the illustrations it is evident that true cytases, slowly diffusible through agar, may be isolated in appreciable quantities.

Influence of temperature upon nuclease, E. C. Teodoresco (*Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 12, pp. 554–557*).—These tests were made with the nucleases obtained from a pteridophyte (*Pteris aquilina*), a lichen (*Evernia prunastri*), and a basidiomycete (*Pholliota mutabilis*).

The results show that plant nucleases do not entirely lose their cleaving properties when heated to 69° C. Such an opinion has also been rendered by Sachs for nucleases of animal origin. The optimum temperature for nuclease activity was found to be in the neighborhood of 34°.

The influence of toluol upon zymases and phosphatese, H. Euler and D. Johansson (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 2–3, pp. 175–181*).—Living yeast under normal conditions has no esterifying properties in a sugar solution containing phosphates. If toluol is present the phosphate is quickly bound to the carbohydrate.

Experiments in regard to enzymatic phosphate fixation, H. EULER and D. JOHANSSON (*Hoppe-Seyler's Ztschr. Physiol. Chem., 80 (1912), No. 2–3, pp. 205–211*).—By treating glucose with a weak alkali an intermediary substance is produced in which inorganic phosphate is fixed through the agency of phosphatese. See also a previous note (E. S. R., 27, p. 407).

A new method for the detection and estimation of small quantities of nitrous acid, E. H. MILLER (*Analyst, 37 (1912), No. 437, p. 345*).—This is a colorimetric method and depends upon the production of a yellow color when adding a solution of dimethylanilin hydrochlorid to a saturated solution containing nitrous acid. The compound formed is paranitrosodimethylanilin. The process recommended for carrying out the estimation is as follows:

"A solution of dimethylanilin hydrochlorid is required, containing 8 gm. of dimethylanilin and 4 gm. of hydrochloric acid per 100 cc., and a standard solution of sodium nitrite containing 1 part of nitrous acid per 100,000. The estimation is performed in Nessler cylinders, or a colorimeter. Fifty cc. of the solution under examination is introduced into a cylinder, acidulated with 1 drop of concentrated hydrochloric acid, and 3 drops of the dimethylanilin solution added and allowed to stand 15 minutes. If the solution is very weak, it may be necessary to allow it to stand for 30 minutes, or longer, for the complete development of the color. The color is then matched in the usual manner against the standard solution, which is acidulated with 1 drop of concentrated hydrochloric acid, and 3 drops of the dimethylanilin solution added. The method is very sensitive, and will detect with ease 1 part of nitrous acid per 1,000,000. The presence of nitrates does not interfere with the estimation. The great advantages of the method are its sensitiveness and simplicity."

Determination of phosphoric acid by the Lorenz and Nyssens methods, T. F. SUKHENKO (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 4, pp. 477–490*).—A comparative study was made between the Lorenz (E. S. R., 13, p. 14) and Nyssens (E. S. R., 13, p. 614) methods and the usual molybdate method for determining phosphoric acid in pure sodium phosphate, soil extracts obtained by extracting with 10 per cent hydrochloric acid, red clover seed, superphosphate, Thomas slag, and phosphorite. All these methods yield comparable results.

The use of aluminum for detecting arsenic, E. KOHN-ABREST (*Ann. Falsif., 5 (1912), No. 46, pp. 384–388*).—Activated aluminum in the form of turnings or strips may be used in the Marsh apparatus for detecting small amounts of arsenic. The method recommended for toxicological work is as follows: Take about 4 gm. of sheet aluminum (6 to 7 pieces, weighing about 0.6 gm. each) which has been previously cleaned with nitric acid and activated by immersion in 25 cc. of 1 per cent mercuric chlorid solution for 4 minutes, rinse with water, and place in a 250 cc. generating flask containing 220 cc. of water. In about 2 hours introduce the neutral sample to be tested and proceed according to the Marsh method.

Determination of arsenious acid with potassium permanganate, L. MOSER and F. PERJATEL (*Monatsh. Chem., 33 (1912), No. 7, pp. 751–758; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 15, p. 718*).—It is pointed out that arsenious acid can be accurately determined by dissolving from 0.1 to 0.3 gm. of the substance in a solution which contains 1 gm. of sodium hydroxid, diluting with 100 to 200 cc. of water, acidifying with 10 to 15 cc. of concentrated hydrochloric acid of specific gravity 1.19, and titrating in the cold. An acid solution of arsenious acid is first neutralized with sodium hydroxid, then 5 to 10 cc. of hydrochloric acid is added, and titration done as stated above.

On phosphotungstic-phosphomolybdic compounds as color reagents, O. FOLIN and W. DENIS (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 239–243; abs. in*

Zentbl. Biochem. u. Biophys., 13 (1912), No. 20–21, pp. 803, 804).—The reagent for uric acid is prepared as follows: To 750 cc. of water add 100 gm. of sodium tungstate and 80 cc. of an 85 per cent solution of phosphoric acid, boil the mixture under a reflux condenser for 2 hours, and after cooling off, fill up to 1 liter. Two cc. of this solution will give a maximum coloration with 1 mg. of uric acid.

As a reagent for phenols, 100 gm. of sodium tungstate, 20 gm. of phosphomolybdic acid, and 50 cc. of phosphoric acid are dissolved in 750 cc. of water, heated for 2 hours under a reflux condenser, and after cooling, filled up to the liter mark with water. Two cc. of the reagent gives a maximum coloration with 1 mg. of uric acid or tyrosin. It is important that the reagents used contain no nitrates or strong alkalis.

For conducting the tests, from 1 to 2 cc. of the reagent is mixed in a test tube with about the same amount of the fluid to be examined, and then an excess of a sodium carbonate solution is added. With the reagent, 1 part of uric acid in 500 parts of water, or 1 part of tyrosin in 1,000,000 parts of water can be detected.

Tyrosin in proteins as determined by a new colorimetric method, O. Folin and W. Denis (*Jour. Biol. Chem., 12 (1912), No. 2, pp. 245–251; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 20–21, p. 804*).—One gm. of the dried protein is brought into a 500 cc. Kjeldahl flask with 25 cc. of 20 per cent hydrochloric acid, and heated for 12 hours with a microburner. Evaporation is prevented by attaching a Hopkins condenser. The solution is then transferred to a 100 cc. graduated flask and filled to the mark with water. Of this solution from 1 to 2 cc. is placed in another 100 cc. flask with 5 cc. of the tyrosin reagent mentioned in the abstract above, and after 5 minutes 25 cc. of a saturated solution of sodium carbonate is added. The flask is then filled to the 100 cc. mark, and after 10 minutes compared with a standard solution containing 1 mg. of tyrosin, 5 cc. of the reagent, and 25 cc. of sodium carbonate solution, and filled to the 100 cc. mark. The colorimeter used was of the Duboscq type.

The results obtained by this method are higher than those yielded by the hydrolytic method.

Kumagawa-Suto method of estimating fat in animal substances, R. Watanabe (*Biochem. Ztschr., 41 (1912), No. 1–2, pp. 71–77; abs. in Analyst, 37 (1912), No. 437, pp. 354, 355*).—These are the results of a critical study of this method (E. S. R., 25, p. 12), and show that it is very reliable for estimating fat in flesh, liver, kidneys, heart, pancreas, intestines, skin, bones, pleural and ascitic fluids, and frogs, without drying before saponification. When used for blood, defibrinated blood, blood serum, blood plasma, and brains, it is advisable to use an aliquot of the alcoholic extract for estimating the fat.

Determination of cellulose.—Cellulose methods v. "crude fiber" methods, C. F. Cross and E. J. Bevan (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 13 (1912), Sect. VIa, pp. 101, 102; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 18, p. 870*).—This is a criticism of the work of König and Hühn,[1] and the methods of determining cellulose in industrial fibers based on acid hydrolysis followed by oxidation.

"The cholorination process, regarded by König and Hühn as a purely oxidative process, when properly controlled shows a minimum secondary oxidizing action, being mainly confined to a specific chlorination of the lignin groups. The

[1] Ztschr. Farb. Indus., 10 (1911), Nos. 21, pp. 297–300; 22, pp. 327–330; 23, pp. 344–348; 24, pp. 366–370; 11 (1912), Nos. 1, pp. 4–9; 2, pp. 17–29; 3, pp. 37–46; 4, pp. 57–64; 5, pp. 77–81; 6, pp. 102–109.

'crude fiber' methods favored by König and Hühn yield residual products of degradation by treatments more or less arbitrary because they are relatively nonselective in their actions, which are ill-defined through the complex and unascertained relation of the products to the mother-substance. Moreover, the manipulation is too lengthy for technical purposes. The authors are confident that the chlorination process, which has been repeatedly approved by workers in this domain of chemistry, will remain the standard method for the estimation of cellulose."

The estimation of citric acid in the presence of certain other acids, L. Gowing-Scopes (*Abs. in Chem. Trade Jour., 51 (1912), No. 1334, p. 616*).—An examination of Beau's modification of Deniges' method for estimating citric acid indicated that this method is unreliable. An alternative method is proposed using a reagent composed of mercuric nitrate, manganese nitrate, and nitric acid. Test results showed a maximum error of +0.0003 and −0.0004. Accurate estimations, it is stated, could be made in the presence of all common acids other than malic, lactic, and hydrochloric.

Relation between the iodin value and the structure of the acids of the oleic series, G. Ponzio and C. Gastaldi (*Gaz. Chim. Ital., 42 (1912), II, No. 1, pp. 92–95; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 18, p. 884*).—It is a well-known fact that the iodin value of oleic acid, when determined by the usual methods, approaches the theoretical figure, while that obtained for crotonic acid is too low. In this work, comparative experiments, using the Hübl, Wijs, and Hanus methods were made which show "that undecylenic acid (in which the double linkage is distant from the carboxyl group) behaves like oleic acid, while 2.3 hypogæic acid (prepared by the action of potassium hydroxid on *a*-iodopalmitic acid) and 2.3 oleic acid (prepared by the action of potassium hydroxid on *a*-iodostearic acid) behave like crotonic acid in this respect. The low values obtained in the case of the acids having the double linkage near the carboxyl group appear to be due to a retardation of the velocity of the reaction, for on prolonging the action, values closely approaching the theoretical were obtained with 2.3 oleic acid, using the Wijs reagent. The results obtained show that the determination of the iodin value of an unsaturated acid may be of value in ascertaining the position of the double linkage in the molecule."

Food chemistry in the year 1911, J. Rühle (*Ztschr. Angew. Chem., 25 (1912), Nos. 43, pp. 2203–2208; 44, pp. 2244–2252*).—A retrospect of the more important researches and work done in the field of food chemistry during the year 1911.

Formic acid in food products, F. L. Shannon (*Amer. Food Jour., 7 (1912), No. 7, pp. 118–120*).—A continuation of studies reported (E. S. R., 28, p. 204).

For quantitative work, using the platinum method (E. S. R., 25, p. 614), the author experienced the greatest difficulty in obtaining a reduction of platinum chlorid. The mercuric chlorid method (E. S. R., 25, p. 311) was tried with various plain and fruit sirups and resulted in showing that even the distillate obtained from simple sirup was capable of reducing mercuric chlorid. Notwithstanding this, the conclusion drawn is that "the formation of formaldehyde coupled with the formation of lead formate and their subsequent identification would furnish a conclusive and positive proof of the presence of formic acid, and that the mercuric method is the most reliable method for determining the amount used."

About a physical-chemical method for examining the changes taking place in meat, O. von Fürth and E. Lenk (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 3, pp. 189–197, figs. 5*).—The method consists of cutting out a cube of the flesh, determining its weight, and immersing it in water or a salt solution for a specified length of time. It is then carefully

taken from the liquid, the extraneous moisture removed, and weighed again. The gain in weight is proportional to the age of the meat, and the swelling is due particularly to the formation of lactic acid, which has a great affinity for water, and which increases as the meat grows older. These tests were conducted with flesh from the bovine, horse (heart), rabbit, and partridge.

Polarimetric determination of starch in bologna, P. LEHMANN and E. SCHOWALTER (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 5, pp. 319–327; abs. in Ztschr. Angew. Chem., 25 (1912), No. 43, p. 2225*).—In the method recommended, 27.5 gm. of the comminuted product is mixed with 80 cc. of an alcoholic potassium hydroxid solution, allowed to stand over night, and then heated on a water bath under a reflux condenser until solution takes place. The insoluble particles are allowed to settle, the supernatant fluid poured off, and the residue treated in the same manner with 30 cc. of potassium hydroxid. The fluid is again poured off, and the residue washed with from 50 to 55 per cent of alcohol until the filtrate shows no turbidity, when acid is added. The insoluble residue is then dissolved by treating with 25 cc. of water and 5 cc. of double-normal sodium hydrate solution and heated for ½ hour on a water bath. The solution is neutralized with normal hydrochloric acid, and heated with 25 cc. of normal hydrochloric acid for 10 minutes. After cooling it is neutralized with 12.5 cc. of double normal sodium hydroxid, transferred to a 100 cc. flask, with addition of 3 cc. of subacetate solution and 6 cc. of 10 per cent ammonium nitrate solution, filled to the 100 cc. mark, filtered, and polarized in the 200 mm. tube. Each circular degree equals 1 per cent of starch.

A new colorimetric method for the determination of vanillin in flavoring extracts, O. FOLIN and W. DENIS (*Jour. Indus. and Engin. Chem., 4 (1912), No. 9, pp. 670–672*).—By the use of the author's phosphotungstic-phosphomolybdic reagent (see page 804), a colorimetric method for the determination of vanillin has been devised which gives theoretical results with artificial solutions of vanillin. With authentic vanilla extracts values were obtained which agree well with those yielded by the official method.

Tables for the microscopic examination of official drug powders, H. ZÖRNIG (*Tabelle zur Mikroskopischen Bestimmung der Offizinellen Drogenpulver. Berlin, 1912, pp. VI+54*).—These analytical tables give a description of the gross and histological appearances of the various drug powders, mostly botanical. In addition a few micro-chemical tests are included.

Improved apparatus for detecting sulphured grain, G. H. BASTON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 111, pp. 23, 24, fig. 1*).—The author substitutes for the cork stopper in the Erlenmeyer flask commonly used in this method (E. S. R., 22, p. 213) a hollow ground glass stopper with a glass delivery tube. The hollow in the center of the stopper is filled with cotton to act as a filter. The method as modified is described.

Capillary phenomenon observed with woman's and cow's milk, A. KREIDL and E. LENK (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 119 (1910), III, No. 6–7, pp. 365–388*).—Continuing work previously noted (E. S. R., 21, p. 175), the authors now show from studies of human milk during various stages of the lactation period that milk when absorbed by bibulous paper (filter paper) will rise to various heights. The amount of casein and the condition in which it is suspended in the emulsion seems to explain this phenomenon. This view was substantiated by ultramicroscopic observations.

Capillary phenomena observed with milk from various animals and on other animal fluids, A. KREIDL and E. LENK (*Sitzber. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., 120 (1911), III, No. 4–7, pp. 229–268; abs. in Zentbl. Biochem. u. Biophys., 13 (1912), No. 1–2, pp. 30, 31*).—This is a continuation of

the studies noted above, in which the author reports some tests made with the milk from the bovine, horse, dog, pig, and goat, and with pure solutions of casein, horse blood, pancreatic juices and bile. The tests were made with the same apparatus used in previous investigations, but with some modifications. Furthermore, the tests were conducted in an atmosphere saturated with water vapor.

The capillarity of milk was found to be due to the amount of water, protein, and inorganic salts present in the mixture and to the physical solubility conditions of these substances. The amount of capillary rise is dependent upon the casein concentration, and the physical condition in which the casein is present is of secondary importance. Milk having its fat removed shows only slight increase in the amount of capillary rise. Milk treated with rennet shows an increase in capillary rise until the point is reached where the milk is coagulated. If rennet is allowed to act for a long time upon milk the amount of rise is diminished and is in a measure due to the stoppage of the pores of the paper by coagulated protein. The various kinds of milk examined showed a difference in capillarity, but in most instances it can be considered a true expression of the casein content of these milks.

In the case of the milk from the cat and dog, and other milk containing a large amount of fat, the fat plays a rôle in this phenomenon. Horse blood, pancreatic juice, and bile act in proportion to their protein content.

The iron content of woman's and cow's milk, L. Langstein and F. Edelstein (*München. Med. Wchnschr., 59 (1912), No. 31, pp. 1717, 1718*).—This is a polemic discussion in regard to the methods used by Lachs and Friedenthal (E. S. R., 26, p. 314), Edelstein and von Csonka (E. S. R., 27, p. 412), Nottbohm and Weisswange (E. S. R., 27, p. 411), and von Soxhlet (E. S. R., 28, p. 611) for the determination of iron in milk.

The iron content of goat's milk, A. Bartmann (*Ztschr. Biol., 58 (1912), No. 8–11, pp. 375–419; abs. in Zentbl. Physiol., 26 (1912), No. 12, p. 514*).—The amount of iron found per liter was from 1.498 to 2.51 mg. These results are lower than those usually reported.

Apparatus for the determination of fat by the Röse-Gottlieb method, W. Brinsmaid (*Amer. Food Jour., 7 (1912), No. 7, pp. 115–117, figs. 4*).—A pictorial description is given of the Röhrig tubes used in the Röse-Gottlieb method and some handy accessory apparatus for holding these tubes.

Estimation of dirt in milk, W. F. Lowe (*Chem. News, 106 (1912), No. 2750, pp. 61, 62; Brit. Food Jour., 14 (1912), No. 165, pp. 161, 162*).—It is claimed that Lehmann's method does not give the true amount of dirt (cow dung) present in milk because from 88 to 89 per cent passes out into the milk as moisture, extractives, and soluble salts. According to this the weight of dirt found as dry substance should be multiplied by 8 instead of 5 as recommended by Lehmann.

In making the test, while an arrangement almost like that recommended by Houston was found to be most convenient, a much less expensive piece of apparatus can be made from a ½ liter conical milk bottle with the bottom removed, and to the neck of which is attached a small graduated tube, widening out at the top to fit the neck of the bottle. The graduated tubes are divided into 0.01 cc., have the bottoms open, and are provided with a stopper or cap for the purpose of facilitating the removal of the sediment.

"After the sediment has settled, for which purpose it is allowed to stand over night, and its volume has been noted, the milk is poured off into its sample bottle, sufficient remaining in the little tube to retain the sediment. The tube is then detached and is filled up with water, and the sediment washed until free from milk; it is then run out through the bottom into a flat, thin watch-glass,

and is examined under the miscroscope with a 1 in. or ¾ in. objective, and some of it can be placed on a slide for higher powers."

As a rule the sediments noted in these tests were composed mostly of broken-down vegetable tissue stained yellowish by bile. For determining whether this coloration was due to bile a modification of Pettenkorfer's test was used.

Note on the detection of benzoic acid in milk, C. REVIS (*Analyst, 37 (1912), No. 437, p. 346; Brit. Food Jour., 14 (1912), No. 165, pp. 168, 169*).—The method, which according to the author is not entirely original with him, is as follows:

"One hundred cc. (not less) of milk is diluted with an equal volume of water, and, after the addition of 5 cc. of 10 per cent sodium carbonate solution, heated in boiling water for 2 to 3 minutes; 10 cc. of 20 per cent calcium chlorid solution is then added, and the heating continued until coagulation of the casein, etc., is complete. The liquid is then cooled and filtered, and the filtrate neutralized with hydrochloric acid to litmus paper. Ten cc. of Fehling's copper sulphate solution (not mixed with the tartrate solution), followed by 10 cc. of a solution of potassium hydrate (containing 31.18 gm. per liter) is now added, and the liquid again filtered. The filtrate is poured into a separating funnel, acidified with hydrochloric acid, and extracted with about 50 cc. of ether. The ether is then washed 3 times with a little distilled water. About 10 cc. of water is now added to the ether in the funnel, together with 1 drop of phenolphthalein solution, and then a saturated solution of barium hydrate added gradually, until, on violent shaking, the aqueous layer remains pink. This is then filtered off into a porcelain basin and evaporated to about 5 cc. The contents of the basin are filtered into a test tube and dilute (1:100) acetic acid dropped in until the pink color is discharged, after which 2 more drops are added. The liquid is then tested with 1 drop of 10 per cent neutral, freshly prepared solution of ferric chlorid, when, in the presence of benzoic acid, the usual characteristic precipitate is obtained. This method will detect 0.02 per cent of benzoic acid.

"The test with ferric chlorid is the most reliable and characteristic, but it is necessary that everything else shall, as far as possible, have been removed, which the above method ensures. When examining cream, 50 cc. should be diluted to 200 cc. with water and the same treatment applied."

On the disappearance of added formaldehyde in milk, M. E. JAFFA and C. H. MCCHARLES (*Amer. Food Jour., 7 (1912), No. 7, pp. 114, 115*).—It was the purpose of this work to determine how old a milk may become which has been preserved with formaldehyde and still show the presence of the preservative with the usual test.

"It would appear from the results that it is possible to ascertain the presence of added formaldehyde to milk with a dilution of 1:10,000 when the milk is at least 38 days old and probably will show the test for a few days longer. In the cases of milk where the preservative has been added in the proportion of 1:5,000 of milk, it can be easily detected if the sample is 3 months old. The method used in this investigation was what is known as the Leach test."

In addition to this it is shown that milk preserved with formaldehyde 1:10,000, kept at a temperature of from 75 to 85° F., would show the presence of formaldehyde when the milk is 32 days old.

Crude phytosterol from coconut fat, crude cholesterol from butter fat, and the detection of butters adulterated with coconut fat, D. D. KEDROVITSCH (*Ztschr. Untersuch. Nahr. u. Genussmtl., 24 (1912), No. 5, pp. 334, 335; abs. in Ztschr. Angew. Chem., 25 (1912), No. 43, p. 2226*).—In these experiments 6 coconut fats were found to contain from 0.09 to 0.3 per cent of crude phytosterol, which when converted into phytosterol acetate had a melting point of 122 to 125° C. Several samples of butter had a crude cholesterol con-

tent of about 0.3 per cent, and the acetate prepared therefrom melted at from 113 to 113.5°. It is thus possible to detect the addition of 10 per cent of coconut fat to butter fat.

Alcoholysis and the composition of coconut oil, G. D. ELSDON (*Abs. in Chem. Trade Jour., 51 (1912), No. 1334, p. 616*).—Haller's method was used for determining the composition of coconut oil.

It was found that the process was useful as a qualitative test but gave only approximate results when employed for quantitative purposes, and, furthermore, required too long a time for its execution. The composition of coconut fat was found to be approximately as follows: "Caproic acid, 2 per cent; caprylic acid, 9 per cent; capric acid, 10 per cent; lauric acid, 45 per cent; myristic acid, 20 per cent; palmitic acid, 7 per cent; stearic acid, 5 per cent; and oleic acid, 2 per cent. No other fatty acids were detected."

Nonproteins in nitrogenous substances of the sugar beet, K. SMOLENSKI (*Ztschr. Ver. Deut. Zuckerindus, 1912, No. 678, II, pp. 791–808; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 15, p. 739*).—In some previous work (E. S. R., 25, p. 201) the author reported results on the nonprotein nitrogenous compounds occurring in beet juice. The compounds identified at the time were vernin, allantoin, asparagin, glutamin, and betain. Tyrosin and cholin were not present. The work was continued, and the substances precipitated from an expressed juice with mercuric nitrate, after previous treatment with basic lead acetate, were more closely examined.

In this way 0.005 per cent of allantoin and 0.01 per cent of asparagin were separated, "but glutamin, vernin, tyrosin, cholin, trigonellin, and lysin could not be identified in the particular juice examined. The presence of asparagin and allantoin appears to be characteristic of the juice from Russian factories especially in dry seasons, as is also the absence of glutamin, which is generally present in French, German, and Austrian beets, but replaced in the Russian product by asparagin. Betain was also separated, the maximum amount obtained being 0.2 per cent. When vernin occurs in the normal juice of the sugar beet, it is probably originally present as a nucleo-protein, while allantoin appears to be present in the beet in the form of a readily decomposable compound, the identity of which has not been determined."

Preliminary report on sugar production from maize, C. F. CLARK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 111, pp. 1–9*).—As a result of a season's work carried on at Garden City, Kans., and Washington, D. C., during 1912, it was noted that contrary to the findings of Blackshaw (E. S. R., 27, p. 314) by the removal of the immature ears from cornstalks the sucrose content of the juice is greatly increased. There is also a small increase in nonsugar solids and a very pronounced increase in purity. The percentage of invert sugar is not materially affected. The purity coefficients of the juices are relatively low, the highest being 67.4 per cent.

Corn was also found to compare favorably with sorghum as a sugar-producing plant, but only so far as the chemical composition of the juice was concerned. "The corn grown at Garden City from which the ears had been removed was higher in solids than either sorghum or Louisiana sugar cane, but lower than Hawaiian cane. The corn grown at Washington was slightly higher than the sorghum in solids, but lower than either Louisiana or Hawaiian sugar cane. At Garden City the sucrose content was higher in the corn than in sorghum, while at Washington the opposite condition was found. In both instances it was lower than in sugar cane. The percentage of invert sugar was higher in corn than in either of the other plants. The nonsugar solids were lower in corn than in sorghum, but higher than in sugar cane. The purity was lower in corn from both localities than in sorghum or sugar cane."

Report in regard to the activities of the agricultural-chemical control station, and the experiment station for plant diseases of the Agricultural Chamber for the Province of Saxony, H. C. MÜLLER ET AL. (*Ber. Agr. Chem. Kontroll u. Vers. Stat. Pflanzenkrank. Prov. Sachsen, 1911, pp. 69*).—This report presents analytical results obtained from fertilizers, waters, sewage, feeding stuffs, milk and other dairy products, foods, seeds, etc., and discusses the damage caused by smoke and ashes.

METEOROLOGY—WATER.

Climatic conditions on the Truckee-Carson project, F. B. HEADLEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 114, pp. 25–30*).—Data regarding length of season, temperature, rainfall, evaporation, and winds during the period from 1906 to 1912 are summarized.

It is shown that the season is long enough for the quicker-ripening crops. The absolute maximum temperature recorded in any year was 103° F. in August, 1908; the minimum, —15° in January, 1910. July is the hottest month, and January the coldest. The wind is an important factor in growing crops in this area, especially in those sections where the soil is sandy and easily blown. The total annual wind movement is not large, but heavy winds from the west or southwest occasionally occur in the spring and summer and do considerable damage to seedling alfalfa and other tender crops. The rainfall is so light as to be almost a negligible quantity, averaging only 5.04 in. annually for the 7 years 1906 to 1912. Evaporation is high, amounting to 63.54 in. annually from a water surface during the 5 years 1908 to 1912.

Wells and subsoil water, W J MCGEE (*U. S. Dept. Agr., Bur. Soils Bul. 92, pp. 185*).—This is a more complete account of studies partly reported in a previous article (E. S. R., 27, p. 511). From the studies was obtained "a large body of data indicating the subsoil-water level in every State and 90 per cent of the counties of mainland United States. The depth of the water level beneath the surface varies from place to place, but is in over 60 per cent of the wells, and in most States on the average for all wells, within capillary reach of the surface soil," the data bringing out the fact that the upper level of the ground water "is not far from the limit of its availability for crop growth."

The results indicate a steady lowering of the ground-water level since the settlement of the country and suggests various causes for this, such as increased consumption, "changes in natural circulation attending clearing and cultivation," and waste in run-off.

Field records relating to subsoil water, W J MCGEE (*U. S. Dept. Agr., Bur. Soils Bul. 93, pp. 40*).—This is an account of field investigations made during 1909–10 "to ascertain the relations between soil and water where the local rainfall is less than that required for crop production." The investigations were made in the Great Plains region of South Dakota, Washington, southwestern Kansas, Uncompahgre Valley, Colorado, and the Modesto-Turlock district of California.

The main conclusions are that "there is a natural subsurface supply of water rising either to the subsoil or within reach of capillarity which is available for plant growth. The amount (estimated last year at 12 in. for South Dakota) may be estimated in southwestern Kansas at 8 in., and (provisionally) for the general high plains region at not less than 6 in.

"This subsurface supply in the Plains suffices, in conjunction with the local rainfall, to render the land productive and habitable over a vast area which would otherwise be unproductive. . . .

"Throughout intermontane valleys there is not only concentration of water by surface flow, but a corresponding accumulation and concentration within the valley deposits by subsurface percolation to an extent yielding a variable though considerable subsurface water supply available for agriculture."

Apparently "success attends dust mulching and other dry-farming operations only in districts receiving a subsurface supply of water under conditions of natural subirrigation."

SOILS—FERTILIZERS.

The microscopic determination of soil-forming minerals, W. J. McCaughey and W. H. Fry (*U. S. Dept. Agr., Bur. Soils Bul. 91, pp. 100, pl. 1, figs. 11*).—The bulletin describes the methods of mineralogical examination of soils which have been found useful in the Bureau of Soils of this Department and reports the results of determinations of the mineralogical composition of different types of soils. The bulletin is intended as a manual or handbook for the laboratory worker in scanning soils. It includes a bibliography of the subject.

Lateritization of the soil under arid climates, C. Ulpiani (*Staz. Sper. Agr. Ital., 45 (1912), No. 9, pp. 629–653; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2602–2604*).—The more important conclusions arrived at are that "at the surface of the earth, since the glacial epoch, owing to the formation of laterite, the stock of clay in the soils of hot countries has been gradually diminishing. Two different types of agricultural soil have been originated, superficial and compact clay soils, special to the cold and cold-temperate zone; the other consists of the deep and permeable laterite soils of the hot and warm-temperate zone. For each type of soil there exists a different form of agriculture, each having its special needs."

The relative solubilities of the chemical constituents of rocks, C. H. Smyth, Jr. (*Jour. Geol., 21 (1913), No. 2, pp. 105–120*).—A study of the relative solubility of different mineral constituents in rocks and the amounts in stream waters of drainage basins, as determined from analyses made by different investigators, showed only a most general relation, but it is believed that the method of comparison can be used, where the necessary data are available, with instructive results.

Observations on the behavior of the principal mineral constituents of the soil as regards evaporation, P. Principi (*Gior. Geol. Prat., 10 (1912), No. 1, pp. 14–20, figs. 4; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 11, pp. 2372, 2373*).—The general conclusions reached in this work were that evaporation is most rapid from the materials which give the largest pore spaces and that it remains almost the same whether it arises from a free water surface or from thin films covering the particles of the wet material.

The significance of the lime-magnesia ratio in soil analyses, P. L. Gile and C. N. Ageton (*Jour. Indus. and Engin. Chem., 5 (1913), No. 1, pp. 33–35; abs. in Chem. Abs., 7 (1913), No. 5, p. 855*).—The more important points emphasized in this article are summarized by the authors as follows:

"The soil experiments to test directly the effect of the lime-magnesia ratio on the growth of plants have given conflicting results. This lack of agreement may be due to the fact that some of the experiments were not properly carried out; or it may be that the apparently confirmatory results arrived at by some investigators are to be attributed rather to alterations in the soil reaction than to the lime-magnesia ratio. From the effect of salts on plants grown in water cultures we should not expect plants to be influenced by the ratio of the bases

under the conditions obtaining in any but alkali soils. From field observations it is certain that soils with an exceedingly wide ratio of lime to magnesia may be exceptionally fertile. Hence it would appear that in analyses of ordinary soils the ratio of lime to magnesia is of no significance, but in analyses of the soluble salts of alkali soils the ratio of lime to magnesia may be exceedingly important."

Solubility of manganese in soils, P. DE SORNAY (*Bul. Assoc. Chim. Sucr. et Distill., 30 (1912), No. 3, pp. 96–100; Ztschr. Ver. Deut. Zuckerindus., 1913, No. 684, II, pp. 49–53; Internat. Sugar Jour., 14 (1912), No. 167, pp. 648–652; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 21, p. 1045; Jour. Chem. Soc. [London], 102 (1912), No. 601, II, p. 1089; Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2606–2608; Chem. Abs., 7 (1913), No. 6, p. 1071*).—"The amount of manganese present in 37 soils from several different localities was in the mean from 0.15 to 0.2 per cent. Only traces of the total manganese in the soil are soluble in water; very weak nitric acid dissolves somewhat larger quantities. Most plants contain a considerable proportion of manganese in their ash; the proportion in the natural plant is usually less than 0.01 per cent, but it is universally present, indicating that plants assimilate it naturally. Manganese is present in leguminous seeds but not in the husks. Aspartic acid usually causes considerable quantities of the manganese in the soil to pass into solution."

The behavior of acid amids in the soil, S. L. JODIDI (*Jour. Franklin Inst., 175 (1913), No. 3, pp. 245–258*).—This article reports investigations which had as their object a study of the behavior of acetamid and propionamid, which the author has shown to be among the principal constituents of acid extracts of soils. The more important conclusions reached are that "acetamid and propionamid readily undergo in the soil the process of ammonification. As in the case of amino-acids [E. S. R., 26, p. 320], the rate of transformation of the acid amid nitrogen into ammonia is greatly influenced by their chemical structure, so that acid amids of equal structure yield about the same proportion of ammonia. The maximum percentages of ammoniacal nitrogen obtained from acetamid and propionamid were 83.43 and 75.14, respectively."

Preliminary note on the occurrence of acidity in highland soils, A. A. MEGGITT and A. G. BIRT (*Agr. Jour. India, 8 (1913), No. 1, pp. 69–73*).—Preliminary field and laboratory studies of an infertile highland alluvial soil of India led to the conclusion that the infertile condition was due "largely to a definitely toxic organic compound, acid in character, the evil effects of which may be largely, if not entirely, overcome by the use of lime." The composition of the compound is not disclosed.

The movement of nitrates in the soil, V. ROUSSELLE (*Ann. Sci. Agron., 4. ser., 2 (1913), I, No. 2, pp. 97–115, figs. 5*).—The rate of vertical penetration and of rise by capillarity of nitrates was studied in soils in metal boxes 45 cm. long and 5 cm. square, to which varying amounts of water were added. One side of the boxes was removable to facilitate taking of samples at different depths.

In very wet soils the penetration was irregular; in dry soils it was very slow. In clay soils 1 cm. of water carried down the greater part of the nitrate dissolved at the surface to a depth of 7 cm. and to a depth of 5 cm. in a soil of more crumbly structure. In moist soils the penetration is expressed by the formula: Penetration $=h\times\frac{100}{c}$, in which h is the height of the water applied and c is the water capacity (by volume) of the soil. When the water level was maintained in the soil at a depth of 4 cm. the nitrate was completely carried to the surface by capillary rise of the water.

The results in general indicate little loss in drainage of nitrate applied as a top-dressing. The investigations of others bearing on this subject are reviewed.

The influence of a preceding crop on nitrification in soil, T. L. LYON and J. A. BIZZELL (*Jour. Indus. and Engin. Chem., 5 (1913), No. 2, pp. 136–138*).—This article is summarized as follows:

"Plats of land planted to certain crops in 1910 were kept bare of vegetation during the early part of the growing season of 1911. Determinations of nitrates in the soil of these plats showed a distinct and characteristic relation of the several plants to the nitrate content of the soil in the year following that in which the plants were grown.

"Maize was the only crop following [in] which the nitrates in the previously planted soil were higher than in the unplanted soil. Potato soil was the next highest in nitrates, and oat soil contained least nitrates.

"Millet planted on these plats July 1 was markedly influenced by previous crops, but the luxuriance of growth was inversely proportional to the nitrate content of the plats.

"The beneficial influence of a crop on a succeeding one was not, in this case, to be attributed to the favorable influence exerted on nitrification, but this would doubtless differ with different soils, and if this effect of certain plants on nitrification in the following year should be of general application, the influence of a crop on nitrification may be an important factor in crop rotation."

The formation of leaf mold, F. V. COVILLE (*Jour. Wash. Acad. Sci., 3 (1913), No. 3, pp. 77–89*).—Observations were made on the rate and character of decomposition in leaves of various kinds in barrels and concrete pits exposed to the weather.

It was found that in the earlier stages of decomposition the mold had a decided acid reaction, but that as the decomposition progressed it became alkaline. This is ascribed to the fact that the leaves contain a high percentage of lime, varying from 1.73 per cent in freshly fallen red oak leaves to 4.38 per cent in gingko leaves. "As the decomposition of such leaves progresses the acid substances are disorganized and largely dissipated in the form of gases and liquids, while the lime being only slightly soluble remains with the residue of decomposition, the black leaf mold, and renders it alkaline."

Other causes of soil acidity are referred to and the adaptation of various plants to acid soils is discussed with a view to suggesting a system of acid-soil agriculture.

"Although some of our agricultural plants are tolerant of acidity, our agriculturists have not yet recognized the possibility of building up for acid soils a special agriculture in which all the crops are acid-tolerant."

Researches on soils, G. P. DARNELL-SMITH (*Rpt. Govt. Bur. Microbiol. N. S. Wales, 2 (1910–11), pp. 209–223, figs. 10*).—The article discusses the structure of root hairs and their relation to osmotic pressure, crystalloids and colloids in relation to soil fertility, soil nitrogen, and Rhizobia from several species of Acacia and other plants.

The successful use of dilute nitric and sulphuric acids to neutralize alkali soil and improve its physical condition is reported. The growth of corn in its early stages was increased by adding cultures of Azotobacter to the soil. There was no effect on barley and potatoes. The nitrogen dropped to a low level in 3 months in a sandy soil to which materials rich in carbohydrates as well as those rich in nitrogen were added and then continuously watered. In dry soil the nitrogenous substances appeared to favor nitrogen fixation. The evolution of nitrogen was twice as rapid from a poor soil to which peptone and potassium nitrate were added as from a rich soil so treated.

It was found that the bacterial flora of a soil was changed by addition of potassium nitrite and nitrate, ammonium sulphate, oxalic acid, and citric acid. Starch had no effect.

Analysis showed the nodules of *Acacia mollissima* to contain 1.78 per cent of nitrogen, the leaves 1.17 per cent, small roots 0.76 per cent, stems 0.34 per cent, and the larger roots 0.28 per cent. The soil in which the tree grew contained 0.09 per cent. The Rhizobia of several species of Acacia and of *Glycine clandestina* and *Kennedya rubicunda* are described.

Investigations on "sickness" in soil, soil sterilization, and some practical applications (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 1, pp. 27–32*).—This is a review of various recent contributions to this subject.

[Soil and fertilizer investigations] (*Wisconsin Sta. Bul. 228, pp. 20, 21, 22–28, figs. 4*).—Various investigations are summarized as noted below:

Soil management, A. R. Whitson (pp. 20, 21).—A brief account is given of the improvement of poor sandy soils at the substations at Spooner, Crivitz, Sparta, and Ashland Junction by the use of green manures and potash and phosphatic fertilizers with the addition of lime in some cases.

State soil survey (pp. 22, 23).—The state soil survey was carried on in cooperation with the State Geological and Natural History Survey and the Bureau of Soils of this Department. It included during the season of 1911–12 reconnoissance surveys "of the soils in Douglas, Bayfield, Burnett, Washburn, Sawyer, Ashland, Forest, and Florence counties. Also, in connection with the state forestry department, examinations of soils have been made in part of the state forest reserves, to determine the agricultural value of certain lands.

"The field work of detailed soil surveys was completed in 1911 in Fon du Lac, Juneau, La Crosse, Kewaunee, and Columbus counties, and in 1912 in Jefferson County, while in Bayfield and Dane counties similar surveys have been started.

"In all 85 different types of soils, which have been classified into 17 series, have been described in the detailed work."

Condition of phosphorus in soil and availability of various phosphates, W. H. Peterson and E. Truog (pp. 23, 24).—Oxidation of the organic matter increased the solubility in dilute acids of the phosphoric acid and of the iron and aluminum of the soil, but not the lime and manganese or the nitrogen in constant ratio. See also previous notes (E. S. R., 27, pp. 122, 127). "In greenhouse tests oats made much better growth on freshly precipitated and dried ferric phosphate than on rock phosphate, while with rape the results were strikingly the reverse."

Relation of bacteria to the availability of phosphates, W. E. Tottingham and C. Hoffmann (pp. 25, 26).—Subjecting rock phosphate to the action of fermenting manures "over periods of from 3 to 6 months caused a marked decrease in the amount of water-soluble phosphorus in manure alone, or in mixtures of manure either with rock phosphate (floats), or with acid phosphate. In the case of the manure-floats mixture, less than half as much water-soluble phosphorus was found after fermentation as was originally present. The addition of either chloroform or formaldehyde, which practically inhibited bacterial action, greatly reduced the decrease in water-soluble phosphorus in such mixtures of manure and floats, indicating that the loss occurring during fermentation was due to bacterial development." This conclusion was confirmed by the results of further laboratory experiments and by pot tests with barley.

Effect of level of sulphur supply on plant growth, W. E. Tottingham (p. 26).—Greenhouse experiments showed that "in the case of rape and radishes, both

plants high in sulphur, sulphur fertilization had a marked effect on the yield of dry matter."

Influence of green manuring upon germination of seeds, C. Hoffmann (pp. 26, 27).—In pot tests it was found that the decomposition of clover used as a green manure sometimes interferes with the germination of cotton seed, "but does not have any material effect on the germination of corn, wheat, and clover. Two experiments conducted with flax have, however, shown a similar detrimental effect to that produced on cotton. The results so far secured indicate that the decomposition of green manures results in a reduction of the oxygen supply and an increase in the carbon dioxid present in the soil atmosphere. It is thought that this change in gaseous content of the soil prevents the germination of the cotton and flax seed, which contain a high percentage of oil, and so require more oxygen for germination than such seeds as corn, clover, and wheat."

Increase in nitrogen fixation of soil due to application of carbohydrates, C. Hoffmann (pp. 27, 28).—"The application of sugar markedly increased the fixation of atmospheric nitrogen by the soil organisms which are able to fix nitrogen in the absence of any legume. This increased activity of these bacteria produced an actual increase of nearly 1,000 lbs. of nitrogen per acre-foot in 3 years. Similar results, though not quite so striking, were secured by the application of starch to the soil. It is interesting to note that when kainit and floats were applied together with either sugar or starch, the increase in the nitrogen-fixing power was not so marked."

Studies in plant nutrition, I, W. H. Jordan (*New York State Sta. Bul. 358, pp. 11–30*).—In the investigation here reported three questions were studied "by growing plants in a forcing house in artificial soils under varying conditions of plant food supply, viz: (a) The relative availability to certain species of plants of phosphoric acid in various combinations, acid phosphate, a finely ground raw phosphate (floats), Thomas slag, dehydrated Redonda phosphate, and bone meal; (b) the effect of fineness of division upon the availability of a ground raw phosphate; (c) the fertilizing value of an iron ore waste.

"The results reached show that certain species of plants possess a greatly unlike ability to acquire phosphoric acid from given sources. The cruciferous plants, cabbage and rape, utilized freely the phosphoric acid from ground Florida rock (floats) while with the graminaceous plants, barley, millet, and oats, this form of phosphoric acid had small availability, if any.

"Taking the several species of plants as a whole, the acid phosphate proved to be more efficient in the production of plant substance than any other source of phosphoric acid, although it showed no great superiority over Thomas slag. The phosphoric acid in the dehydrated Redonda phosphate, though less available than in the two forms mentioned, proved to be much more available than in the floats.

"Crops were grown during two seasons with the use of ground Florida rock and ground bone, the former varying in fineness from that which would pass through a sieve 60 meshes to the inch to 'floats,' the bone meal ranging from 60 mesh material to 'fine,' the latter being a grade finer than that which would pass through a bolting cloth. With three successive crops of rape grown after one application of the phosphates, the effect of fineness was not marked, but with the peas, barley, and rape grown in 1903–4 on an improved artificial soil the availability of phosphoric acid in the Florida rock to all three crops, measured by the amount appropriated, was greatly influenced by the degree of fineness, the amount taken up from the floats being at least one-half more than what was used from the coarsest material. With bone meal the degree of

fineness has little influence, if any. Much the largest appropriation of phosphoric acid was from the acid phosphate.

"The proportion of phosphoric acid to the growth of dry matter in the plants increased with the increase in fineness of division of the Florida rock, or, in other words, in proportion to the availability.

"Similar tests proved the phosphoric acid in an iron ore waste to be of slight availability for plant growth."

A new method of so-called water culture, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11 (1913), No. 2, pp. 17–21, fig. 1*).— This article reports experiments with serradella grown in standard nutrient solutions with and without the addition of ground basalt, phonolite, granite, or humus extract.

The plant made little or no growth in nutrient solution alone or in solutions to which the basalt and phonolite (both basic substances) were added, but made a vigorous growth in the solutions to which the acidic granite was added and a somewhat less vigorous growth in the solution to which the slightly alkaline humus extract was added.

Guano and the guano trade (*Zentbl. Kunstdünger Indus., 18 (1913), Nos. 3, pp. 51, 52; 4, pp. 67, 68*).—The various sources of guano in America are described and the character of the different guanos is discussed. The European imports of guano are stated to be about 300,000 tons annually, a large part of which (about 70,000 tons in 1910) was furnished by Peru, which uses in its own agriculture about 30,000 tons.

The value of peat as a filler and a fertilizer, J. M. MCCANDLESS (*Jour. Amer. Peat Soc., 6 (1913), No. 1, pp. 9–14*).—This is an argument in favor of such use of peat, the author reporting an analysis which indicates a rather high percentage of soluble humus and nitrogen compounds in peat used as filler.

Peat as an agricultural asset, T. S. GLADDING (*Jour. Amer. Peat Soc., 5 (1912), No. 1, pp. 1–9*).—The author concludes from a review of the literature of the subject that "the consensus of expert opinion is unanimous as to the great value of peat as a soil maker, a soil renovator, and a fertilizer. It is a serious question whether the great value of peat as a fertilizer should not exclude its use for other purposes."

The new nitrogenous fertilizers, M. LAMBERT (*Jour. Agr. Prat., n. ser., 25 (1913), No. 6, pp. 174–176*).—This article deals with the synthetic products calcium cyanamid and calcium nitrate. It enumerates the factories engaged in the manufacture of these products and their estimated output. It also briefly discusses the fertilizing value of the products. It is stated that factories for the production of calcium cyanamid are in operation or in course of construction in Norway, Sweden, Germany, France, Switzerland, Austria, Italy, Japan, and America (at Niagara Falls and in Alabama), the total product being about 150,000 tons in 1912. The output of calcium nitrate was 75,000 tons in 1912.

The utilization of the nitrogen of the air, A. A. NOYES (*Pop. Sci. Mo., 82 (1913), No. 3, pp. 237–242*).—This article presents facts which "suggest that the problem of supplying plants with the nitrogen needed by them may ultimately be solved most simply and directly by the biologist," but until a perfect solution by this means is worked out "we shall be dependent on nitrogenous fertilizers; and one of the great tasks of the chemist is to cheapen such fertilizers by obtaining the nitrogen contained in them directly from the air." The lines along which successful processes for this purpose have been worked out are discussed. The author has "little doubt that from these sources a large additional supply of nitrogen compounds will soon be available and that their cost will be gradually lowered."

The manufacture of nitrates from the atmosphere, E. K. Scott (*Monit. Sci., 5. ser., 3 (1913), 1, No. 854, pp. 106–116, figs. 6*).—This is a French translation of an article which has already been noted (E. S. R., 27, p. 420).

Progress in by-product recovery at coke ovens, J. E. Christopher (*Jour. Soc. Chem. Indus., 32 (1913), No. 3, pp. 115–125, figs. 14*).—This article discusses improvements in processes and the increase in their use. Of one of the most important of the by-products, ammonium sulphate, it is stated that the world's output has increased from 500,000 to 1,000,000 tons since 1900 without material effect on the price.

Some investigations on the influence of ammonium sulphate on the phosphate fertilizing of oats, E. A. Mitscherlich and W. Simmermacher (*Landw. Vers. Stat., 79–80 (1913), pp. 71–96, figs. 4*).—This article reports studies of the effect of ammonium sulphate, ammonium chlorid, sodium sulphate, calcium sulphate, and magnesium sulphate on the solubility, in varying amounts of water saturated with carbon dioxid, of dicalcium and tricalcium phosphate, as well as pot experiments to test the effect of ammonium sulphate on the assimilation of the phosphoric acid of monocalcium, dicalcium, and tricalcium phosphates, Thomas slag, and of the soil by oats.

The solubility of dicalcium and tricalcium phosphates in water saturated with carbon dioxid was greatly increased by the addition of ammonium sulphate and chlorid, and sodium and magnesium sulphates. It was decreased by the addition of calcium sulphate. The addition of larger amounts of ammonium sulphate than are commonly used in practice was injurious to the plant. Ammonium sulphate had no effect upon the assimilation of the phosphoric acid of superphosphate and of Thomas slag by oats. It was also without effect on the phosphoric acid of the soil.

The author concludes that the nitrogen supplied by the ammonium sulphate as well as the physiologically acid condition which it brings about in the soil must be taken into account in explaining its fertilizng effect.

Investigations on the phosphoric acid exchange in plants at different stages of growth and with varying applications of phosphates, L. Seidler (*Landw. Vers. Stat., 79–80 (1913), pp. 563–610*).—These investigations were made by means of pot experiments with barley and oats and included a careful study of the amount and form of phosphoric acid in the soil and in the plants under the varying conditions of fertilizing.

It was found that nitrogen increased at the end of the period of growth in the above-ground parts of the plants. In many cases, and particularly with oats, there was a decrease of nitrogen in the roots. There was an increase in the total phosphoric acid, increased in the above-ground parts and in the growth, but this bore no direct relation to the increase in dry matter. The inorganic phosphate taken up by the plant during its growth was largely converted into organic phosphorus compounds. In the case of barley these compounds were in large part albuminoids and lecithin, in oats largely phytin. The phosphoric acid of the phytin, which constituted only a small fraction of the total phosphoric acid, increased in the above-ground parts and in the entire plant almost to the end of the period of growth, but steadily decreased in the roots. The proportion of organic to inorganic phosphorus increased with growth in the case of barley and also in case of oats, although in the latter the amount of organic phosphoric acid as a rule was less than that of the inorganic phosphoric acid.

A new departure in the manufacture of agricultural phosphates (*Engin. and Min. Jour., 94 (1912), No. 9, pp. 385, 386; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 11, pp. 2350,*

2381).—This article describes a process of rendering raw rock phosphates available by calcination alone or with "salt cake."

The composition of the kainit of commerce, E. ROULLIER (*Bul. Agr. Algérie et Tunisie, 19 (1913), No. 3, pp. 67–70*).—Analyses are reported which show that the composition of the kainits of commerce varies from those in which chlorids predominate to those in which sulphates predominate. The advantages of the latter over the former as fertilizer are pointed out.

The Searles Lake potash deposit, C. E. DOLBEAR (*Engin. and Min. Jour., 95 (1913), No. 5, pp. 259–261, figs. 3; Amer. Fert., 38 (1913), No. 4, pp. 46–49, figs. 3*).—Examinations by the author of conditions in the nearly dried-up bed of what was an ancient lake, known as Searles or Borax Lake, in southern California, are described.

The area of the lake bottom is about 40,000 acres. "A considerable area at the southern end of the bottom is covered with detritus from the valley and mountains beyond. Other portions are composed of efflorescent crusts from a fraction of an inch to several feet thick, and still other portions are composed of clay muds. . . . The muds are permeated with water containing soluble salts. . . . This mud area is annular in shape, surrounding the central portion of the bottom. As the main portion of the mud area is approached the mud becomes softer and wetter, . . . a thin layer of crystalline salt appears on the surface; . . . [and] a solid bed of underlying crystalline material is encountered. This underlying bed rises nearer and nearer the surface as one goes farther into the central portion of the 'lake.' Presently the overlying and underlying crystalline bodies meet and become a solid, pinkish-white, smooth, hard salt floor extending over an area of about 12 square miles."

Borings in the salt-bed area showed "that the average thickness of the double-salt bed is a little over 70 ft.; that the first 23 ft. is mostly sodium chlorid, with a greater or less amount of impurity in the form of sodium sulphate and small amounts of sodium carbonate and borax; that the underlying 47 ft. is composed of strata of mixed sodium chlorid, sulphate, carbonate, bicarbonate, and borax, together with potassium chlorid."

The brines from this underlying deposit carry 4.49 per cent of potassium chlorid, the solid salts 3.64 per cent. It is estimated that the brines of the deposit are capable of furnishing 6,465,600 tons of potassium chlorid, the solid salts 23,900,000 tons. The deposit is also rich in borax and sodium carbonate. The author claims that he has had "full knowledge of the existence of potash in commercial quantity at this deposit since the middle of May, 1911."

Potash deposits of Searles Lake and other regions withdrawn from entry (*Tradesman, 69 (1913), No. 11, pp. 37, 38*).—Reference is made to the withdrawal from public entry by recent Executive orders of 133,829 acres of potash-bearing lands in Columbus Marsh, Nevada, and Searles Lake and Panamint Valley, California.

A contribution to the question of fertilizing with sodium salts, B. SCHULZE (*Landw. Vers. Stat., 79–80 (1913), pp. 431–448, pls. 2*).—In pot experiments with white mustard grown on soil deficient in potash and fertilized with sodium and potassium chlorids, it was found that soda as well as potash was apparently utilized by the plant in building tissue and that soda may replace potash to a certain extent for this purpose. The soda of sodium chlorid is very quickly taken up by plants and converted into plant substance. Since soda is not absorbed by the soil as rapidly as potash its fertilizing action is more lasting if it is not washed out of the soil. Potash decomposes soda zeolites in the soil and sets the soda free. On the other hand, soda decomposes potash zeolites to only a slight extent or not at all.

Lime rich in hydraulic silica as a fertilizer, H. IMMENDORFF (*Landw. Vers. Stat., 79–80 (1913), pp. 891–901; abs. in Ztschr. Angew. Chem., 26 (1913), No. 32, Referatenteil, p. 242*).—From a series of pot experiments, which are briefly reported, the author concludes that burnt lime containing a considerable percentage of silicic acid has no injurious effect on the soil if it is carefully spread and worked into the soil. On the contrary, it may exert a beneficial effect by increasing the absorptive capacity of the soil.

The lime and magnesia fertilizer question, MEYER (*Jahrb. Deut. Landw. Gesell., 27 (1912), No. 3, pp. 728–748*).—This article discusses the lime and magnesia requirements of different plants, the effect of lime on the soil, the determination of the lime requirements of different soils, the possible deficiency of magnesia in the soil, the lime-magnesia ratio in soils, and the application of lime compounds. The author does not believe, and cites evidence to show, that the maximum yield is not dependent upon any fixed ratio of lime to magnesia in the soil.

The action of sulphur in the soil, E. LIERKE (*Deut. Obstbau Ztg., 1913, No. 4, pp. 75, 76*).—The author cites observations on fruits which indicated that fertilizing materials containing considerable amounts of sulphur compounds (sulphates) produced better results than those free from such compounds.

Manganese and stimulation in the soil, CLAUSEN (*Deut. Landw. Presse, 39 (1912), No. 97, pp. 1131, 1132, figs. 5*).—In view of the contradictory conclusions reached by various investigators regarding the action of manganese as a fertilizer, the author undertook a series of experiments to test the effect of potassium permanganate and manganese sulphate, and also of ferrous sulphate and peat, on the growth of oats and white mustard.

The results in general showed a marked influence of the manganese salts, applied in varying proportions up to 89 lbs. per acre, on the yield of the plants. Dry spot of oats was checked by applications of the manganese fertilizers.

The so-called stimulants in the soil, QUANTE (*Deut. Landw. Presse, 40 (1913), No. 12, p. 137*).—In reply to Clausen (see above) the author reiterates the conclusions stated in a previous article (E. S. R., 27, p. 629).

Fertilizer analyses, H. B. MCDONNELL ET AL. (*Md. Agr. Col. Quart., 1913, No. 59, pp. 31*).—This publication gives tables showing analyses and valuations of fertilizers inspected from August, 1912, to January, 1913, inclusive, and extracts from the fertilizer law.

Fertilizer registrations, C. S. CATHCART (*New Jersey Stas. Bul. 255, pp. 3–37*).—This is a list of registrations, with guarantied analyses, of mixed fertilizers and fertilizing materials in New Jersey for the year ending October 31, 1913.

AGRICULTURAL BOTANY.

Botanical guide for planters, colonists, and others, H. WINKLER (*Botanisches Hilfsbuch für Pflanzer, Kolonialbeamte, Tropenkaufleute und Forschungsreisende. Wismar, 1912, pp. VII+322*).—Botanical descriptions and economic notes are given of a large number of plants met with in the Tropics, the arrangement being alphabetical according to the genera. In an appendix the author groups the different kinds of plants according to their uses and gives a list of the botanic gardens and experiment stations in the Tropics and Subtropics.

Morphology of cotton branches, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 109, pp. 11–16*).—A study has been made of the types of branches of the cotton plant, and the author claims that there is no necessity of considering the normal development of the cotton plant as resulting in any truly sympodial structure. The pseudosympodial structure of the fruiting branches

is said to arise from the fact that a flower, instead of a branch, is developed from the extra-axillary bud, and from the further peculiarity that the fruiting branches have a stronger tendency to develop one joint at a time. Notwithstanding these differences, the two kinds of branches are considered as homologous in other respects.

Note on Sterculia alata irregularis, W. W. SMITH (*Jour. Asiatic Soc. Bengal, n. ser., 7 (1911), pp. 85, 86; abs. in Bot. Centbl., 120 (1912), No. 23, p. 605*).—The author describes a tree of *S. alata* in the Royal Botanical Garden at Silpur, Calcutta, which showed 5 distinct lines of leaf variation, and gives the results obtained by growing the tree from the seed for a few years.

On a possible relationship between the structural peculiarities of normal and teratological fruits of Passiflora gracilis and some physico-chemical properties of their expressed juices, R. A. GORTNER and J. A. HARRIS (*Bul. Torrey Bot. Club, 40 (1913), No. 1, pp. 27–34*).—The authors present an account of preliminary studies on the physical properties of the juice expressed from normal and teratological plant organs, and from their experiments find that the juice of abnormal fruits has a higher osmotic pressure than that of normal ones. This is true whether the abnormality be a meristic variation in the fruit wall or whether it consists of proliferation of the fruits. The average molecular weight of the substances in solution in the plant sap is apparently lower in the abnormal fruits, but this is less consistently true for the various classes of structural aberrations recognized.

The inulin metabolism of Cichorium intybus.—I, The seedling metabolism, V. GRAFE and V. VOUK (*Biochem. Ztschr., 43 (1912), No. 5–6, pp. 424–433, fig. 1; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 600, II, p. 977*).—It is claimed that the authors' investigations on seeds of chicory sprouting in the dark show that the fat of the seeds sinks continuously in quantity, and that during the first two days the sucrose also diminishes, the inulin not greatly changing meanwhile, after which both inulin and sucrose show an increase. Likewise when grown in light the fat decreases, being supposedly converted into a reducing sugar for immediate use in the building processes of the plant. No simple quantitative relation was found between the reducing sugar and the inulin. The latter increases during the later growth, while the sucrose may decrease. It is claimed that the evidence favors the view that inulin is formed from fat in the process of germination.

The relation of algæ to dissolved oxygen and carbon dioxid, with special reference to carbonates, C. O. CHAMBERS (*Missouri Bot. Gard. Ann. Rpt., 23 (1912), pp. 171–207, figs. 2*).—As a result of his studies on the relation of gases in water to the growth of algæ, the author claims that there is an intimate and mutual relation between the algæ and submerged aquatics in water and the gases dissolved in it. Warm and stagnant water is poorer in oxygen and carbon dioxid than colder water agitated by wind or currents. Currents are especially beneficial to attached plants by renewing or removing these gases.

Some species were found to demand more aeration than others, while some were more tolerant to stagnant water than others. Filamentous forms of algæ with large cells and thin outer walls are best adapted to stagnant waters, and such forms predominate in warm, tropical fresh waters, which are poorly aerated.

The photosynthesis may diminish or deplete the supply of carbon dioxid and increase the oxygen content beyond saturation. In the absence of free carbon dioxid the plants may obtain it from dissolved bicarbonates, chiefly those of calcium and magnesium. Waters rich in lime carbonates are usually rich in vegetation, while bog waters, containing humic acids and consequently poor in carbonates of lime, are poor in vegetation. Stagnant water, on account

of the large amount of carbon dioxid and the small amount of oxygen, favors the formation of colonies and filaments rather than of free individual cells. Aeration, or abundance of oxygen, favors the formation of chlorophyll, and algæ are brighter green in color when well aerated. The periodicity of spore formation does not appear influenced by aeration or gas content of the water, but seems to be a matter of heredity.

A bibliography completes the paper.

A study of the problem of water absorption, L. O. KUNKEL (*Missouri Bot. Gard. Ann. Rpt., 23 (1912), pp. 26–40*).—The author apparently rejects the theory of osmosis and semipermeable membranes as being sufficient to explain water absorption and favors that of the affinity of colloids within the cell.

The mechanics of water provision.—I, The pressure in the conducting system. II, Root activity, O. RENNER (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 576–580, 642–648*).—The author experimented with various plants, finding that twigs and shoots with the tips immersed in water can take up considerable of the liquid. When drawn through freshly cut surfaces, its rate of entrance rapidly decreases in correspondence with the saturation of the neighboring portions, though its admission may continue for hours or days. The removal of neighboring leaves has little or no effect on the rate of entrance. In case of admission through uncut branch ends, and therefore against considerable peripheral resistance, a sudden drop of the potometer index may be produced by cutting away the end of the branch, and this may be repeated by further shortening of the attached portion. This drop is held to indicate a considerable negative pressure in this part. It is thought that this negative pressure may extend into the roots.

In case of rooted plants, increase of osmotic pressure in the nutritive medium is followed immediately by decrease in the internal negative pressure, later by gradual increase; while a decrease of osmotic pressure is followed at once by a heightening of the internal negative pressure followed by a gradual decrease. Further facts are held to show that the relation of the roots is rather passive and that their absorption of water is dependent upon transpiration and the negative pressure so established by the leaves, and the lowering of turgor in the root cells.

Demonstration of the movement of the water in leaves, A. H. COLE (*Trans. Ill. Acad. Sci., 4 (1911), pp. 145–147*).—The author describes a method developed by him for making visible, either with or without the aid of magnification, the movement of the transpiration stream along the xylem strands of live leaves. The use of translucent plant stems and modified leaves was unsatisfactory, but experiments with normal green leaves in which the veins and veinlets appear white when seen by transmitted light gave positive results in case of a number of common cultivated plants. Young corn and barley are preferred for simple demonstrations and projection experiments, beans and lilac for study with the compound microscope.

The method consists essentially in cutting a leaf across near its base and immersing the cut end in a strong solution of eosin. It lends itself readily to projection, showing the progress of the colored liquid through the lumen of the vessels clear up to the leaf margin. A rate of 2 mm. per second is not uncommon. New forms of apparatus, devised to meet special difficulties, are being perfected and are to be reported on later.

Leaf water and stomatal movement in Gossypium and a method of direct visual observation of stomata in situ, F. E. LLOYD (*Bul. Torrey Bot. Club, 40 (1913), No. 1, pp. 1–26, figs. 3*).—The author describes a method for the direct observations of stomata in which he used a microscope provided with a condenser and a 4 mm. objective with long working distance. This was used

in the field and illuminated either with direct sunlight or with a strong artificial light. By this means it was found possible to measure accurately living stomata of leaves with a thickness of 5 mm. without any injury to the leaves.

In a study of the leaf water in Gossypium the author found that it varied in proportion to the dry weight between 318 and 220 per cent. The minimum leaf water content was reached at about the fourteenth hour of the day. This reduction represents a net loss as shown by determinations made relative to unit area and consequently with regard to dry weight. The loss of leaf water is from 7 to 15 per cent of the initial amount at sunrise. This loss is taken as indicative of the daily wilting which is observed to begin about the ninth hour of the day and which may be recognized not only by change in position but by flaccidity of the leaves. It seems that under usual day conditions the roots are unable to supply loss of water from the leaves, and comparative measurements on the same variety of cotton grown in Arizona showed no more unfavorable reduction of leaf water than in Alabama, when there was sufficient water in the soil. The author disagrees with Balls in his view that because growth does not take place in sunshine this is to be interpreted as unfavorable, but he thinks that the measurement of growth should be the amount of material elaborated by the plant, as indicated by the increase in dry weight.

The observations on the stomata showed that they were practically all closed at night, with a strong tendency to open in the early morning hours. The obvious daily opening begins about 6.30 a. m. in Alabama in September, and the maximum is attained at about 8.30 or 9 o'clock, after which closure progresses until 11 o'clock or somewhat later. During wilting there is said to be no temporary opening of the stomata, although a marked rise in the rate of transpiration followed by a sudden reduction of rate has been noticed about a half hour after wilting begins.

The rate of transpiration at different ages of leaves, R. Seeliger (*Ueber den Verlauf der Transpiration in den Verschiedenen Altersstadien des Blattes. Diss., Göttingen, 1911, pp. 117; abs. in Bot. Centbl., 120 (1912), No. 23, pp. 596, 597*).—The author investigated about 10 species of plants in regard to transpiration.

It was found that the leaves were subject to the greatest change of transpiration rate while young. The maximum transpiration was reached in all cases just before the leaves were half grown. It then decreased toward a minimum, which was reached at cessation of growth or just a little before this time. One plant showed a second lower maximum. Some reddened leaves transpired about the same as did green ones of the species, some yellowed ones less. Differences apparently unrelated to age were also noted. Basal leaves of a given twig transpired relatively more and terminal leaves less than those between in case of poplar, while leaves on shoots from roots transpired more than did those on the tree in case of a maple.

The wilting coefficient for plants in alkali soils, T. H. Kearney (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 109, pp. 17–25*).—The author carried on some experiments to determine whether the alkali content of a soil not sufficiently high to cause injury to plants would have the effect of raising the wilting coefficient. Kubanka wheat and 2 natural soils from North Platte, Nebr., containing alkali, were used.

It was found that the presence of an excess of soluble salts in the soil did not affect the ability of the young wheat plants to reduce ultimately the water content of the soil to the wilting coefficient, unless the quantity of salts was sufficient to induce marked pathological symptoms in the plants. The time required for the exhaustion of the water available for growth increased

steadily with increasing concentration of the soil solution. The amount of growth made, so long as the moisture content of the soil remained well above the wilting coefficient, was determined by the concentration of the soil solution. The presence of alkali increased the water requirement of the plants, resulting in a greater quantity of water transpired in producing a unit weight of dry matter.

The relation between the density of cell saps and the freezing points of leaves, W. W. OHLWEILER (*Missouri Bot. Gard. Ann. Rpt., 23 (1912), pp. 101–131, pl. 1, fig. 1*).—A study was made of the density and freezing point of the sap of a large number of trees and shrubs, the observations being made to determine the effect of freezing on many trees and shrubs and also the artificial freezing of the leaf saps of the same species.

A comparison of the data obtained led the author to conclude that extreme differences in sap density are generally accompanied by corresponding differences in resistance to freezing. Whatever exceptions were observed to this rule were believed to be probably due to differences in cell structure and other causes, such as protective location, etc. Where cell structure is essentially the same the density of the cell sap of a species will indicate its relative hardiness. In plants of the same genus, or in varieties of the same species, differences in sap density correspond to differences in their resistance to freezing.

Influence of concentration of nutrients on their absorption by plants, I. PUZHE and D. SHUSHAK (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 13 (1912), No. 6, pp. 823–829, figs. 3; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 4 (1913), No. 3, pp. 382, 383, fig. 1*).—This article has already been noted from another source (E. S. R., 27, p. 826).

Recent results of assimilation investigations with various yeasts and fungi, P. LINDNER (*Chem. Ztg., 36 (1912), No. 68, p. 638; abs. in Mycol. Centbl., 2 (1913), No. 1, p. 24*).—Several of the fungi investigated were found to fix atmospheric nitrogen. Ethyl alcohol, which appeared to be a better source of carbon than sugar, was assimilated by 25 species which could not so use methyl alcohol. Urea was freely utilized as a nitrogen source in the presence of maltose, melibiose, and raffinose. In case of *Saccharomyces farinosus* and *Oïdium lactis*, growth flourished with paraldehyde and acetic acid, was uncertain with benzin and benzol, and was absent with methyl alcohol, formaldehyde, and formic acid. The latter species grew well in acetone, poorly in butyric acid, and uncertainly in ether; the former would not grow at all in these media.

Influence of the salts of zinc, magnesium, calcium, potassium, and sodium on the development of Aspergillus niger, J. BUROMSKY (*Centbl. Bakt. [etc.], 2. Abt., 36 (1912), No. 1–5, pp. 54–66*).—The author reports in some detail the results of his investigations, among which may be mentioned the following:

Zinc is not indispensable to the development of *A. niger*, but it proves stimulative in very low concentrations (0.001 per cent zinc sulphate), while it depresses spore formation more than does ammonium nitrate or ammonium sulphate. Magnesium in the form of the sulphate at 0.25 to 0.5 per cent concentration increases the weight of the fungus. In combination calcium is not readily available as a nutrient. Sodium and potassium gave weak cultures, the action of the latter somewhat resembling that of zinc.

The effect of toluol and carbon bisulphid upon the microflora and fauna of the soil, P. L. GAINEY (*Missouri Bot. Gard. Ann. Rpt., 23 (1912), pp. 147–169*).—A report is given of an investigation undertaken to determine whether the theory advanced by Russell and Hutchinson (E. S. R., 22, p. 121) is adequate to explain the phenomena subsequent to partial sterilization when applied to Missouri soils.

The author claims that small quantities of carbon bisulphid, toluol, and chloroform, such as have been used experimentally, when applied to the soils studied exerted a stimulative effect on the total number of bacteria present; that an application of such quantities of carbon bisulphid and toluol did not have an appreciable effect on the number of types of protozoa present in such soils as were studied; and that a marked increase in yield may be noted following such an application when no evident change occurs in the total number of bacteria present. He believes from his own and other investigations that the theory advanced by Russell and Hutchinson is not tenable for general application.

The admission of vaseline oil into balsam plants, F. Kryž (*Ztschr. Pflanzenkrank., 23 (1913), No. 1, pp. 34–38*).—This is a study of the effects on balsam plants when supplied with equal parts of vaseline oil and water.

The oil was taken up by the roots and distributed through the vessels, being stored in the intercellular spaces of the leaves. It was found also in the unopened buds, but not in the developed floral leaves. The latter were unchanged in appearance by the oil. Transpiration was lowered and growth was checked, as fresh weight, dry weight, and ash weight were all less in the plants supplied with the oil. Development of rootlets and root hairs was also considerably checked, as was absorption of water. The leaves yellowed progressively, lost turgor, and finally died. In all these respects there was no important difference between the effects of vaseline oil and petroleum on the plant.

The effect of methylene blue on the respiration and alcoholic fermentation of living and of killed plants, W. Palladin (*Ber. Deut. Bot. Gesell., 29 (1911), No. 8, pp. 472–476, pl. 1*).—The substance of this article has already been noted from another source (E. S. R., 27, p. 523).

The influence of radium emanation on higher plants, H. Molisch (*Umschau, 17 (1913), No. 5, pp. 95–98, figs. 6; abs. in Bot. Centbl., 120 (1912), No. 15, pp. 389, 390*).—In continuation of studies previously noted (E. S. R., 28, p. 228), the author experimented with vetches, cucurbits, beans, sunflower plants, etc., exposed to weak and to strong radium illumination.

He found that, while the weak illumination in a measure stimulated the growth of young plants, the strong illumination checked or entirely stopped development. *Sedum sieboldii* is said, as the result of strong illumination, to have grown only two opposite leaves in place of the usual whorls of three. This is thought to indicate either a profound alteration in the individual plant or else a mutation. Twigs of *Caragana arborescens*, it is claimed, cast their leaflets as a result of exposure to strong radium illumination. The injury to plants from radium emanation is said to suggest strongly the operation of a poison.

Influence of illumination on growth of seed beets, F. Strohmer (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 6, pp. 913–931, fig. 1*).—Continuing previous work (E. S. R., 25, p. 236), the author investigated the effect of light and darkness on seed beets, finding that limitation of light influences their development unfavorably, lowering the production and size of the seed balls, which produced in some instances weaker plants. These, however, when fully developed, gave a normal yield and normal percentage of sugar and other chemical components, showing no transmission of the injurious effects of deprivation of light on the parent plant.

A further contribution on the influence of light on development of the sugar beet, A. Stift (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), No. 6, pp. 939–943*).—In continuation of work previously noted (E. S. R., 27, p. 642), the author found that in well-illuminated beets the leaf weight aver

aged about 134 per cent of the root weight, while in plants grown in shade it averaged about 526 per cent. The percentage of sugar in the roots was in the illuminated beets 13.25 per cent, in the others 13 per cent. The absolute weights of leaves, roots, and sugar were all greater in the illuminated plants. The results of the experiment were somewhat vitiated by unfavorable conditions.

The influence of light on the germination of seeds of Gesneraceæ, W. Figdor (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 648–653*).—Experiments with 12 species in 9 genera of Gesneraceæ are said to show that all these require light for germination, but that a period of darkness ranging from about 2½ to 7 months regularly shortened from 20 to 50 per cent the final period of exposure to light necessary to germination. To this, however, there were exceptions in several cases in which no effect or the opposite effect seemed to have been produced.

Hail wounds on fruit trees and fruit, E. Voges (*Ztschr. Pflanzenkrank., 22 (1912), No. 8, pp. 457–462*).—A description is given of the injuries to fruit and bark tissue, and of the structures formed for protection and in recovery.

The formation of "töre" in pine wood, I. Nordenskjöld (*Ark. Kemi, Min. och Geol., 4 (1912), No. 3, Art. 28, pp. 21; abs. in Jour. Chem. Soc. [London], 102 (1912), No. 600, II, p. 979*).—This is a discussion of the author's studies of the rich resinous wood which is found in old stumps, etc., some years after the trees have been cut down. The formation of this töre is discussed, along with the composition of such rich pine wood as compared with that of ordinary pine.

Methods of securing seed free from micro-organisms.—I, Aseptic treatment for seed, V. Arcichovskij (*Centbl. Bakt. [etc.], 2. Abt., 36 (1913), No. 15–18, pp. 421–425*).—The results of experiments in treating seeds of various common plants (peas, pumpkins, corn, etc.) with concentrated sulphuric acid, 3 per cent hydrogen peroxid, 1 per cent mercuric chlorid, 5 per cent soap, etc., from 1 to 4 hours, are held to show that such seeds can safely be rendered entirely free from micro-organisms.

Soil bacteriology as a factor in crop production, K. F. Kellerman (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 113, pp. 3–10, fig. 1*).—This paper gives a digest of information relating to soil bacteriology, particularly as associated with the normal physiology of crop plants.

The sulphur bacterium Thioploca ingrica, R. Kolkwitz (*Ber. Deut. Bot. Gesell., 30 (1912), No. 9, pp. 662–666*).—This is a brief comparative study of *T. ingrica* in respect to its relations with two other sulphur bacteria, Thiothrix and Beggiatoa.

FIELD CROPS.

Text-book of agriculture.—Plant culture, G. Krafft (*Lehrbuch der Landwirtschaft. Die Pflanzenbaulehre. Berlin, 1913, vol. 2, 9. ed. rev., pp. VIII+300, pls. 12, figs. 275*).—This book is volume 2 of a series, of which volume 1 is on soil cultivation, volume 3 on stock raising, and volume 4 on farm management. This edition has been enlarged by C. Fruwirth through the insertion of new methods and practices and numerous illustrations. The 12 chapters consider seeding, cultivation, harvesting and production, care of seed and enemies, crops grouped as cereals, legumes, oil-producing crops, drug and spice crops, color-producing crops, leaf-yielding crops, fiber crops, root and tuber crops, soiling crops, fodder crops, mixed grasses, and green manuring crops, and a discussion of cultivation experiments.

Experiments on the influence of electricity on plant growth, GERLACH (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 4 (1912), No. 4, pp. 354–367*).—The application of electric currents in field and pot experiments with rye and oats under different fertilizer treatments showed contrary results as to yield and nitrogen content. The transpiration was reduced from 100 to 88 and the yields from 100 to 83.

Experiments in subsoiling at San Antonio, S. H. HASTINGS and C. R. LETTEER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 114, pp. 9–14*).—Subsoiling for the purpose of increasing the soil moisture did not show favorable results with corn, cotton, and oats in a 3-year rotation. The yields were either slightly increased or slightly decreased on subsoiled land, while the expense was greatly increased. The depressing residual effect on corn and cotton was most marked when the crop was planted from 1 to 8 months after subsoiling, and was slight when 15 months had elapsed. The moisture content was not increased. Tables give data on yields and moisture content.

The fundamentals of crop improvement, W. T. SWINGLE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 116, pp. 3–10*).—The author discusses the influence of the science of crop physiology in its bearing on a raw branch of economic botany in which crop plants may be improved by bringing in some useful characters of their wild relatives, and thus making plant breeding more effective. With this more specific scientific knowledge and practice, the author foresees a more complete organization of efforts between the scientific investigators and the expert producers of any one class of crop plants, resulting in a higher plane of intelligence in farming.

Interpreting the variation of plant yields, F. D. FARRELL (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 109, pp. 27–32*).—This article points out the necessity of taking into account the probable error in a determination of yields of experimental plats and describes the results obtained at Scottsbluff, Nebr., with a method to determine this error for a series of plats previous to the beginning of an experiment. The author believes that to assume 5 per cent as "the probable error in field experiments" is not generally justified.

The work of the Scottsbluff Experiment Farm in 1912, F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 116, pp. 11–21, figs. 5*).—This paper presents the plan of work and notes the year's progress in irrigation experiments with alfalfa, sugar beets, corn, flax, oats, potatoes, and work with wheat including yields; tests of wheat, oat, barley, sorghum, potato, and field pea varieties; orchard and small fruits, trees and ornamentals, and garden vegetables. The work is carried on by this Department in cooperation with the University of Nebraska.

[Experiments with sugar cane, cotton, and legumes], J. R. BOVELL ET AL. (*Rpt. Local Dept. Agr. Barbados, 1911–12, pp. 3–45*).—This is a continuation of a previous report (E. S. R., 26, p. 534).

On ¼-acre plats at Dodds, sugar cane was fertilized with sulphate of ammonia, nitrate of lime, and nitrate of soda in quantities to supply 60 lbs. of nitrogen per acre. Tabulated data show an increased yield of saccharose of 2.95 per cent with sulphate of ammonia over nitrate of lime and 2.66 per cent over nitrate of soda. With the addition of phosphates there was a total decrease of 872 lbs. of saccharose per acre in plant canes, which corresponded with previous results. When the "dead hearts" (injuries caused by the moth borer) were cut out of the growing cane, the yield of saccharose was reduced 312 lbs. per acre. White Transparent produced 29.8 per cent, B 208 38.2 per cent, and B 147 61.4 per cent more sugar per acre than Bourbon varieties.

A system of breeding and selecting cotton plants is described and tabulated, and the results given, with a score card and breeding blank. Grading and other values of some of the varieties of Sea Island and Silket cotton are presented, with tables showing characters, freedom from disease, yield, etc., of some hybrids in 1909–1911. A table shows the results obtained by seed selection.

Tabulated results are reported of varietal tests of sweet potatoes, cassava, legumes, yams, and various fodders, with comments on the onion industry, mangroves, shaddocks, and fruit and vegetable exportation. A report of the local agricultural shows and like activities is also included.

Annual report of the work of the Agricultural College Farm, Poona, 1910–11, J. B. KNIGHT (*Dept. Agr. Bombay, Ann. Rpt. Expt. Work Poona Agr. Sta., 1910–11, pp. 33*).—This work gives the results of some irrigation, manurial, cultural, and varietal experiments with various crops, including cereals, roots, peanuts, and cotton.

It was noted that better yields were obtained by applying irrigation water in small quantities and often, rather than at less frequent intervals in large quantities. Peanuts gave a larger yield on manured and irrigated land than when unfertilized and with dry culture. There was a 11.5 per cent gain in favor of the ridge method of irrigation as against the bed system in alfalfa culture.

Further work in regard to the distribution of seeds, manures, and implements, and studies of prickly pear poisoning is also reported.

Results in crossing grains, W. RIMPAU (*Beitr. Pflanzenzucht, 1912, No. 2, pp. 115–129, pls. 2*).—This paper discusses the results of crossing from 30 to 70 varieties of barley and wheat, extending over a period of 35 years, with special attention to the characteristics, form, and color, and whether natural cross-fertilization took place in the closely placed plants in the breeding plat. Out of 1,000 possible cases of wheat only 12 natural crosses were found, and with barley only 19 out of a possible 1,200.

From the voluminous work of the author and his father,[1] he concludes that out of a heterogeneous cross one can with difficulty produce offspring with constant characters; that parents whose origin is not known to be of pure line breeding should never be used; that all crosses with individual breeding under the Mendelian law should be followed up; and that intermediate forms should not be bred as they contain the variations the longest.

Improved grains and forage crops (*Wisconsin Sta. Bul. 228, pp. 13–16, fig. 1*).—This paper mentions work in breeding cereals carried on at the station by R. A. Moore, in which pedigree rye yielded from 49 to 54 bu. per acre on land that had been in alfalfa. It is stated that this variety of rye has now been disseminated throughout the State, so that there are about 1,200 centers where pedigree seed may be obtained. In the breeding plats barley produced from 44 to 57 bu. per acre. In over 1,000 reports collected by the Wisconsin Experiment Association during the past 5 years, the pedigree varieties of barley produced an average increase of 4.9 bu. per acre over the best competing varieties. Oats produced from 68 to 110 bu. per acre, which was an increase of 20 bu. above previous years under farm conditions. From 16 to 18 bu. of flaxseed was secured per acre on the county demonstration station farm at Superior, and is noted as pointing to the success of flax culture in that part of the State.

E. J. Delwiche, at the Spooner substation, secured a yield of 73 bu. per acre with Wisconsin No. 8 corn, which had been especially developed for the northern part of the State, formerly considered outside the corn belt. At the Ashland substation on heavy red clay Pedigree No. 8 wheat, a strain of Kharkoff winter wheat, yielded 35 bu. per acre. In alfalfa experiments reported the results

[1] Landw. Jahrb., 20 (1891), pp. 335–371.

indicate that variety plays a less important part than vitality of seed in securing quality and hardiness from seeds raised in Wisconsin.

Sowing flax on winterkilled wheat fields, M. W. EVANS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 114, pp. 1–7, fig. 1*).—This paper describes a practice in the vicinity of New London, Ohio, of sowing flax about April 1 in fields where the wheat has been injured by winterkilling. In some cases timothy is seeded with the wheat, in which case the flax is not sown as a rule when it is probable that the timothy will produce a fair crop.

It is stated that the yield of wheat is not appreciably decreased, and the method yields a profitable crop of mixed grain and straw that is sold to the local dealers, who separate the 3 kinds of seeds. Some average yields of 1912 from 8 different fields were flax 7.2 bu. and wheat 3.2 bu. per acre. From 4 of the fields 1.3 bu. per acre of timothy seed was also obtained. The average total income per acre from the 8 fields was $14.64.

Notes on two fiber plants of the Belgium Congo (*Bul. Agr. Congo Belge, 3 (1912), No. 3, pp. 619, 620, figs. 2*).—Two plants, *Manniophyton africanum* and *Triumfetta semitriloba*, are briefly described, and the aboriginal methods of rendering the fiber are given.

Grass demonstrations in the South (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 3–5*).—This paper presents memoranda and correspondence to illustrate the success and interest taken in grass growing demonstrations in 20 counties in South Carolina by this Department. Yields of from 2 to 3 tons per acre are reported, using fertilizer applications per acre of 200 lbs. acid phosphate, 200 lbs. ground bone, and 1 ton lime.

Grasses for canal banks in western South Dakota, A. C. DILLMAN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 115, pp. 23–31, figs. 2*).—A mixture of grass seeds composed of 6 lbs. brome grass, 6 lbs. western wheat grass, 6 lbs. alfalfa, and 2 lbs. red top per acre is recommended after experimenting with 12 varieties in search for a covering for canal banks of the Bellefourche irrigation project.

A treatise on hay, E. GAIN and D. BROCQ-ROUSSEU (*Traité des Foins. Paris, 1912, pp. 795, figs. 177*).—This work is divided into 16 chapters, covering the botanical and chemical composition of hay, hay plants, making and storing hay, the color, special hays, deterioration, including aging, fermentation, etc., poisonous and disease-causing hay plants, digestibility, estimating hay values, classification, European hays, hays of the French colonies, statistics, etc.

Two types of proliferation in alfalfa, R. A. OAKLEY and S. GARVER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 115, pp. 3–13, figs. 8*).—This paper presents observations on the root and stem proliferation that seems to belong to the more hardy types of alfalfa.

"*Medicago falcata* showed underground stems or rhizomes to be more prevalent and better developed in the low-spreading, fine-leaved, fine-stemmed types than in those more closely resembling *M. sativa*. However, not all of the forms included in the low-spreading type exhibit tendencies to produce new plants vegetatively. Some spread only over the surface of the ground, the procumbent stems proceeding from fairly compact and high-set crowns without becoming attached to the soil at any point. It was extremely difficult in the case of certain procumbent types to determine whether proliferation was largely the result of an inherent tendency of the plant or was induced to a considerable degree by cultivation."

In regard to root proliferation, these studies disclose what is thought to be a type wherein new plants are produced from true lateral roots 4 to 12 in., rarely more, beneath the surface and running almost directly parallel with it. These proliferous roots apparently are given off from any portion of the branching taproot, within the limitations of the depth above indicated.

"At irregular intervals along the lateral roots, swellings occur, usually about twice the diameter of the roots and from ¾ to 1¼ in. in length. Upon these swellings buds appear, some of which give rise to new plants, while many remain undeveloped. Fibrous roots are rather sparingly produced from the lateral proliferous roots, and in many instances the swellings are devoid of them; in fact, new aerial shoots reach a considerable degree of development before roots of any importance are sent out from the swellings. There appears to be quite a difference in the plants that arise from the proliferous roots with respect to root development; some develop a crown and root system of their own at an early date, while others rely for an indefinite period on the proliferating roots for their support."

Alfalfa growing in Michigan, V. M. SHOESMITH (*Michigan Sta. Bul. 271, pp. 99–136, figs. 9*).—This bulletin gives the results of, and comments upon, reports received from numerous Michigan farmers in regard to raising alfalfa in the State, representing 701 different seedings with a total acreage of 4,065 acres.

The principal causes of poor results or failures in seeding alfalfa reported were poor preparation of seed bed, lack of inoculation, winterkilling, weeds, light, infertile soil, seeding with nurse crop, and insufficient drainage. The greatest number of good seedings, 72.7 per cent, were secured on gravel soil, with clay subsoil, and the greatest number of failures, 15.4 per cent, on sand soil with gravel subsoil. A firm seed bed gave the greatest number of successes, 50.8 per cent, as against a medium or loose seed bed. With 8 weeks or longer in preparing the seed bed 50 per cent of the seedings were good, with 4 to 7 weeks 32.9 per cent, while with 3 weeks or less only 31.7 per cent was classed as good.

Of 550 reports on the application of lime, 50.1 per cent of the limed seedings gave good results and 33.9 per cent of those without lime. The failures with lime were 0.1 per cent, and 7.9 per cent were failures without lime. Where soil inoculations were used 50.5 per cent of the seedings were good and 1.1 per cent failures. Where nitro-cultures were used, 36.4 per cent of the seedings were good and 4.9 per cent failures. The largest number of failures, 33 per cent, occurred with September or later seedings on light soil, and on heavy soil the best results were obtained from July 16 to 31, 68 per cent of the seedings being good. Better results were obtained without a nurse crop at all seedings after June 1, but the contrast was greatest in September and later, when 15.4 per cent were reported as good with a nurse crop and 40 per cent of those without a nurse crop. The most favorable results were obtained when from 20 to 25 lbs. of seed per acre was used. Northern-grown seed gave better seedings than seed from unspecified sources. Good results were secured by harrowing after a stand was secured in 49.2 per cent of the reports.

The artificial curing of alfalfa hay, H. B. MCCLURE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 116, pp. 27–31, figs. 2*).—This paper presents the results of a 4-year experiment with a type of kiln consisting of a series of conveyors that pass the freshly cut alfalfa hay through a current of heated air. This method is designed for those localities where alfalfa can be readily grown but where the climatic conditions interfere with natural curing. The artificially cured hay is classed as "choice," and chemical analyses showed that it contained considerably more protein than the field-cured hay. It also effects a large saving in the leaves and smaller stems. While "the process for the present must be confined to large growers, or to smaller growers operating on a community basis, the drying plant may be expected to pay for itself in 4 years under adverse conditions and in a single season under favorable conditions."

The germination test of seed corn, H. D. HUGHES (*Iowa Sta. Bul. 135, pp. 307–379 figs. 22*).—In this experiment covering 1910 and 1911, 13 seed testers were used involving various principles which employed moist cloth, zinc, blotter, wood, sand, and earth contacts for the kernels. All tests were carried out in duplicate, and during the second year all tests were read by several different persons. About 45,000 ear test readings were made. All the individual ears shown by any one of the tests to have one or more viable kernels among the six tested were planted on adjacent plats. When the plants were about 5 weeks old, a count was taken and the actual percentage of stand determined. Yield determinations were made in the fall.

Testing the vitality of seed corn before planting seemed to have increased the profits 93.6 per cent per acre in 1910 and 85.7 per cent in 1911. Home-made testers seemed to give as accurate results as the much more expensive commercial kinds. Some of the testers discarded a large amount of valuable seed corn. The cost of germinating 100 ears varied from 15.6 to 45.3 cts.

Considering all of the 2-year readings, an increase of 1 in the number of weak kernels resulted in a decrease in stand of 2.62 per cent; an increase of 1 dead kernel from weak, a decrease of 5.7 per cent stand; and an increase of 1 dead from strong, a decrease of 7.64 per cent. With ears testing 5 strong and 1 weak, the stand was decreased 6 per cent. With ears testing 5 strong and 1 dead, the stand was decreased 10.8 per cent.

There seemed to be no relation between yield and vitality as determined by examination of the "feeding roots." Plants from horny kernels showed more rapid growth and gave greater yields than did those from starchy kernels.

Equally as high yielding ears can apparently be selected by either an early or late reading of the germination test, though fewer ears are likely to be selected from the early readings.

Report of corn pollination, M. L. FISHER (*Proc. Ind. Acad. Sci., 1910, p. 245*).—This is a report of the continuation of the work of 1908, previously noted (E. S. R., 22, p. 535).

Using Boone County White, male, and Reid Yellow Dent, female, 40 ears were pollinated. "Four were pure yellow and 36 were mixed. In a count of 2,000 kernels from mixed ears, 204 showed pure yellow, 276 pure white, and 1,520 mixed white and yellow, often cream color. In this connection it is to be noted that it is difficult to tell when a kernel is pure white. The yellow tinge may be so faint that the most careful examination in a good light may not detect it."

Using Stowell Evergreen, male, and Reid Yellow Dent, female, 47 ears were hand pollinated. "None was pure sweet or pure dent. Thirteen showed earlier ripening than the others and were smaller in size. There seemed to be a larger proportion of sweet kernels on these ears. The stalks on which they grew were also earlier maturing and smaller in stature. A count of 2,000 kernels showed 322 white, 1,165 yellow, and 513 sweet. The sweet being recessive, the proportion agrees fairly well with Mendel's law."

Using Speckled, male, and Reid Yellow Dent, female, 16 ears were pollinated. "Four were pure speckled, 12 were not speckled. Most of those not speckled were pure red, and a few (3) were pure yellow. This also seems to be Mendelian."

Using Reid Yellow Dent, male, and Boone County White, female, with an unknown number of ears, the same mixture of kernels was found as in the reciprocal cross. There were no pure ears. In 2,000 kernels there were 486 pure white, 1,306 mixed, and 208 pure yellow.

The abortion of fruiting branches in cotton, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 118, pp. 11–16*).—In this paper the author ascribes the light yields of luxuriant cotton plants to abortive fruit branches, and from a study of crowded and normally placed large plants concludes that abortiveness is favored by a competitive growth between the vegetative and fruiting branches in which the latter become crowded and overshadowed and accordingly unable to attain a normal development. A direct physiological abortion of the lower fruiting branches was also observed. It is pointed out that this study presents evidence that conditions which favor luxuriant vegetative development are unfavorable to crop production, and indicates the importance of cultural methods to avoid luxuriant growth and suppress vegetative branches.

Supernumerary carpels in cotton bolls, R. M. Meade (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 111, pp. 25–28, figs. 2*).—This abnormality consists of a solid, elongated, whitish body, developed in the center of the boll between the placentas. It was discovered at Lanham, Md., Glendale, Cal., and Clarksville, Tex. In some cases these abnormal carpels contained rudimentary seeds, with fiber attached. This abnormal growth was connected with unfavorable growing conditions, such as a cold, wet season as at Glendale, or too short a growing period as at Lanham. Similar abnormalities were noted with *Hibiscus syriacus*, on the Department grounds at Washington, D. C.

Cotton culture, J. M. Kimbrough (*Georgia Sta. Bul. 100, pp. 229–248, fig. 1*).—This bulletin gives results of variety and fertilizer tests, continuing work previously noted (E. S. R., 26, p. 735).

In tests with about 40 varieties from 1907 to 1912, inclusive, Cleveland has made the best average of any tested. The highest yield was made by McElhenny Cleveland in 1910, with 2,256 lbs. of seed cotton per acre. The lowest was in 1907, with 975 lbs. per acre by Hart Improved. The highest percentage of lint, 45.2 per cent, was by Summerors High Linter in 1911, and the lowest was 24.1 per cent by Steinheimer Cleveland in 1909.

The fourth year of the fertilizer test showed yields apparently slightly in favor of kainit as opposed to muriate of potash, especially when the fields were infested with rust. In the nitrogen series, the cotton-seed meal plats averaged for the 4 years 1,309 lbs. seed cotton per acre, nitrate of soda 1,327 lbs., and sulphate of ammonia 1,372 lbs. The author believes that the superiority of the ammonium sulphate was probably due to some loss of nitrogen in the nitrate by leaching, while the nitrogen in the cotton-seed meal did not become available rapidly enough to meet the requirements of the plant.

In a comparison of 397 lbs. of acid phosphate, 343 lbs. of cotton-seed meal, and 43 lbs. of muriate of potash with 432 lbs. of acid phosphate, 243 lbs. of tankage, and 48 lbs. of muriate of potash, the cotton-seed meal plats yielded 1,411 lbs., the tankage plats 1,365 lbs., and the check plats 1,062 lbs. of seed cotton per acre. When 339 lbs. of acid phosphate, 343 lbs. of cotton-seed meal, and 43 lbs. of muriate of potash were applied per acre in comparison with 450 lbs. of acid phosphate, 177 lbs. of dried blood, and 48 lbs. of muriate of potash the dried blood plats yielded 1,275 lbs., the cotton-seed meal plats 1,261 lbs., and the check plats 943 lbs. of seed cotton per acre.

A new system of cotton culture, O. F. Cook (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 115, pp. 15–22*).—The author describes a new method of cultivation designed to hasten the maturity and increase the yield of cotton, based upon the control of the vegetative branches by a method of trimming, the essential feature of which is later or more gradual thinning.

Tabulated results show an apparent increase of 53 per cent in the yield of seed cotton by the application of this method in comparison with the ordinary method of cultivation.

Egyptian cotton as affected by soil variations, T. H. KEARNEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 112, pp. 17–24*).—This paper presents observations on the uniformity of the staple, strength, and other qualities of the fiber of Egyptian cotton grown under varying soil and irrigation conditions and in relation to alkali salts at Bard, Cal., and Sacaton, Ariz. Tabular results showing the electrical resistance of saturated soils, percentage of total salts, and the condition of the cotton plant are given.

The author concludes that "the moisture capacity of the soil is an important factor in determining the size, vigor, and fruitfulness of Egyptian cotton plants. A larger supply of nutrient salts in the heavier soils is probably also a factor. With irrigation as ordinarily practiced in the Southwest, very sandy soils, having a low moisture capacity, are unsuited to this crop, since the plants are exposed to virtual drought during much of the period between irrigations. Recurring deficiencies of available water in the soil are very unfavorable to the yield and quality of the fiber. New land, as a rule, should be avoided in growing Egyptian cotton, as the soil commonly varies greatly in moisture capacity and the crop produced will be correspondingly lacking in uniformity.

"The alkali resistance of Egyptian cotton is relatively high when other conditions are favorable. It would appear that fair yields of fiber of good commercial quality can be obtained where nearly 0.5 per cent of the total dry weight of the soil consists of readily soluble alkali salts, provided that carbonates ('black alkali') are absent or form only an inconsiderable proportion of the total alkali."

Preparation of land for Egyptian cotton in the Salt River Valley, Arizona, E. W. HUDSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 17–20*).—This paper gives suggestions for the selection of land for planting this cotton, and describes methods for preparing the land where Bermuda and Johnson grass, alfalfa, cotton, or grain had been the previous crop. It is noted that level land should be selected, as it can be more uniformly irrigated and will therefore yield a more uniform product than otherwise. It is suggested that shallow plowing in early winter and frequent cultivating to allow the action of the frost will prove an efficient method of eradicating Bermuda and Johnson grass roots. No trouble should be had with alfalfa land plowed about 2 in. deep and turned up to the sun early in the winter.

Fiber from different pickings of Egyptian cotton, T. H. KEARNEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 37–39*).—This paper reports the difference in quality of cotton fiber from the early opening bolls and those that open later, as the result of an experiment conducted at Sacaton, Ariz., in 1911. The earliest ripening bolls (chiefly those near the base of the plant) were found to contain less abundant, shorter, weaker, coarser, and less uniform fiber than bolls which ripen later. The fiber also was likely to contain more dust and trash, and the seeds were found to be more frequently immature.

Durango cotton in the Imperial Valley, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 111, pp. 11–22, figs. 5*).—This paper gives an account of an effort to introduce a long-staple cotton on the irrigated lands in southern California. Of the 3 methods attempted, viz, selection, crossing, and importation, illustrated by the Columbia, Foster, and Durango varieties, importation of the Durango proved the most successful. It differs from the Columbia chiefly in its habits of growth, producing less foliage and more bolls, which results in a higher yield and better quality of fiber, while Foster dwarfed under the Imperial Valley conditions, resulting in a greatly diminished yield. In Durango cotton the tendency to produce vegetative branches is less than in most other varieties. Another characteristic is the unusually small size of the involucral bracts. A large proportion of the seedlings have lobes on all the leaves, includ-

ing the first leaf above the seed leaf, thereby affording a means of distinguishing it from most varieties.

The superiority of Durango cotton seems to lie in the fact that it contains the desirable cultural qualities of the short-staple varieties, with length and strength of lint formerly obtained only from the Peeler varieties of the Delta region of Mississippi and Louisiana. Its introducton into the Imperial Valley is thought to meet the demand for a long-staple variety and to promise the largest profit.

United States official cotton grades, N. A. COBB (*U. S. Dept. Agr. Bur. Plant Indus. Circ. 109, pp. 3–6, fig. 1*).—This paper describes the preparation of the standard cotton grades established by this Department, and discusses the permanency and value of standardization. A chart depicts the geographical distribution in this country of the sets of grades which have been sold.

A purple-leaved mutation in hemp, L. H. DEWEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 113, pp. 23, 24*).—This paper mentions and describes the appearance of 2 purple-leaved hemp plants found in the seed selection plat at Potomac Flats, Washington, D. C. It is stated to be a singular mutation, showing strongly marked color variation in foliage and seed, arising from a closely inbred strain of a uniform group of plants.

Hemp as a weed eradicator and money crop (*Wisconsin Sta. Bul. 228, pp. 18, 19, figs. 2*).—These pages report the work of C. P. Norgord, in which Canada thistle and quack grass were successfully eradicated and a crop of hemp valued at $118 per acre was secured.

"To be sure of getting results, the land should be fallowed during the latter half of the previous year, manured well, and, if possible, plowed just before sowing hemp in the spring. Trials on upland indicate that hemp can not be profitably grown on any but the best lands. Aside from a lack of fertility, the greatest difficulty lies in the danger of the soil packing, particularly if this is followed by hot weather. To prevent this trouble the hemp may be (1) placed on corn land which was in sod the previous year; (2) grown on sod land; or (3) manured with plenty of strawy manure and then top-dressed, if possible, with manure not containing too much straw, and thoroughly disked into the soil. Experiments conducted on the Horicon marsh indicate that peaty land will produce a large crop of hemp with good fiber."

Relation of stand to yield in hops, W. W. STOCKBERGER and J. THOMPSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 112, pp. 25–32*).—This paper discusses the causes of an imperfect stand, variation in the percentage of perfect stands, variation in stand on a single acre, variation in productive stand, and loss in yield due to defective stand, and presents data thereon. Directions are given for replanting missing hills and properly pruning producing plants as a means of maintaining a perfect stand and a high yield.

Influence of harvest time on yield and chemical composition of meadow foxtail (Alopecurus pratensis), H. VON FEILITZEN, I. LUGNER, and E. NYSTRÖM (*Jour. Landw., 60 (1912), No. 3, pp. 243–280, figs. 5*).—This work is prefaced by a review of literature bearing on the composition and feeding value of this grass. The authors then discuss their own results obtained in an investigation upon the chemical composition and feeding value, moisture content, percentage of stalk, leaf, and sterile shoots, yield, and amount of other grasses and weeds at the various dates of harvesting, ranging from May 23, before the flowering, to July 14, after the grass was dead ripe.

In the comments drawn from the numerous tabulated results and diagrams, they conclude that food value increases with decrease of age; that the sterile shoots retain to a much greater degree their high feeding value as the plant ages than do either the stem or leaf; and that the leaf even after the plant

has flowered and ripened still possesses considerable feeding value. The greatest yield of hay and dry matter was at the third harvest, while the highest feeding value seemed to be at about the time of the second harvest, as the content of protein and carbohydrates was highest and the crude fiber had not risen too high. The authors attribute the wide range of analyses given by other investigators to the probability of the work having been done with the grass at different stages of growth.

The "tuber-unit" method of seed-potato improvement, W. STUART (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 113, pp. 25–31, figs. 2*).—This paper describes a method first recommended by Webber (E. S. R., 20, p. 38), in which uniformity in size, shape, and productiveness of the potato may be improved.

Uniformly shaped tubers weighing from 6 to 8 oz. each are cut into 4 pieces longitudinally, the 4 pieces dropped consecutively, and grouped in spacing so that each unit might be identified and numbered and data taken. The difference between the average yields of tuber units resulting from 2 seasons' trials was over 16 times greater from the strong than the weak ones. The average weight of merchantable tubers from the strong plants was 5.3 oz. as against 3.8 oz. from the weak ones. The culls from the strong plants averaged 1.7 oz. while those from the weak plants averaged but 1.1 oz. Sample forms of note blanks for the recording of data are presented.

Contributions to the cultivation and breeding of rape, V. MANDEKIÉ (*Mitt. Landw. Inst. Breslau, 6 (1912), No. 4, pp. 503–562, figs. 7*).—This work takes up the botanical characteristics, cultivation, and breeding of rape; verifies the fact of the self-fertilization of the flowers; and discusses the correlation of weight and number of seeds to the pods and their position on the stalk with weight and length of the whole plant.

The average length of the ripe plants measured 137.19 cm. (4.5 ft.), of which 14.17 cm. was root and 123.03 cm. stem. An air-dried rape plant without the leaves weighed 27.11 gm., of which the root was 9.48 per cent, the stem 48.91 per cent, the empty pod 18.73 per cent, and the grain 22.88 per cent. Of the above-ground part the stem composed 54.01, the empty pods 20.69, and the grain 25.29 per cent. The shortest pods were always found at the base of the fruit-bearing branches. Dividing the branch into 5 parts, the greatest increase in length of pods was during the first 4 parts with a decrease on the fifth.

The culture of rice at Kasaï, E. MESTDAGH (*Bul. Agr. Congo Belge, 3 (1912), No. 3, pp. 533–537, figs. 5*).—This paper gives the aboriginal methods of rice culture in the Belgian Congo districts, and covers harvesting, thinning, and conserving the crop.

Notes on the culture of tobacco in Sumatra, AMRHYN (*Bul. Agr. Congo Belge, 3 (1912), No. 3, pp. 589–618, figs. 17*).—This paper gives an account of the methods followed, with notes on the climatic conditions and labor.

In the nursery, Bordeaux mixture made of 2 kg. sulphate of copper and 3 kg. of quicklime in 100 liters of water was generally applied on the fourteenth day with success. Against certain animal enemies kerosene emulsion was used, and against insect enemies 100 parts of Bordeaux mixture with 1 part of Schweinfurt green. Three different formulas of fertilizers are in use, (1) 3 parts ammoniacal nitrogen, 10 parts acid phosphate, and 5 parts potash; (2) 10 parts phosphoric acid and 10 parts potash; and (3) 5 parts ammoniacal nitrogen, 10 parts phosphoric acid, and 5 parts potash. These were applied either dry, at the rate of 6 kg. per 1,000 plants, or liquid by dissolving 6 kg. of the mixture in 10 liters of water.

Methods of gathering the crop, transporting to the drying sheds, constructing the fermentation building, and manner of handling, grading, and marketing are described.

The carbohydrates of wheat and wheat products and changes in the same during development of the grain, G. L. TELLER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *13* (*1912*), *Sect. VIa, pp. 273–278*).—This paper gives the results of the second year's work of the author along this line at the Arkansas Station, begun in 1897 (E. S. R., 10, p. 943).

Samples of wheat were collected each succeeding day from the first formation of the grain until several days after ripe and fit for harvest. The nitrogen determinations were made on each sample collected, while for other determinations each 3 days' cuttings were mixed and determinations made of these mixtures.

The author points out a distinct connection between the composition of the 3 parts of the wheat berry, bran, germ, and endosperm, and the composition of the wheat at different periods of growth. No reducing sugars were found in any of the samples of fully matured wheat, but there was an appreciable quantity in the very immature grain. There was also a very distinct falling off in the amount of sucrose, dextrose, pentosans and, in fact, all substances excepting starch as the grain became more mature.

The amount of amids in the very immature grain was large, as was expected, since this is the form in which the nitrogenous bodies are transferred from the stem to the wheat grain. Twelve determinations covering 13 periods are given in tabular form, in which amids ranged from 10.85 per cent in the first period to 0.35 per cent in the thirteenth period, while starches and undetermined constituents ranged from 15.61 to 53.65 per cent.

The methods used to determine the pentosans, sugars, starch, and dextrins are given.

Seed analyses for 1911 and 1912, E. A. BESSEY (*Michigan Sta. Bul. 270, pp. 71–98*).—This bulletin contains the text of the act of 1909 to regulate the sale of agricultural seeds and fruit trees in Michigan, and results of investigations of official and unofficial seed samples examined during 1911–12 are tabulated, giving the number of noxious seeds per pound when present to the amount of 2 per cent by weight, the occurrence of noxious and other weeds in various kinds of commercial seeds, and the composition of samples of seed of very poor quality offered for sale in Michigan in 1911–12.

It is pointed out that great harm is done by the placing of packages of lawn grass seed on the market at low prices containing low grade goods. The introduction of the Russian thistle with alfalfa seed is also noted, and suggestions are made for the strengthening of the law.

Indiana weeds; their control and eradication, G. M. FRIER (*Proc. Ind. Acad. Sci., 1910, pp. 323–334, figs. 9*).—With special reference to Indiana conditions, the author calls attention to the necessity of fighting weeds, and points out the manner in which the various weed seeds spread and the injury they do in robbing and choking out the crop and as a refuge for its insect and fungus enemies. He offers as suggestions for their control buying pure seed, testing the sample, pulling and cutting the weeds, breaking infested ground in the fall and harrowing at frequent intervals to induce germination in fall and spring, and the successful use of iron sulphate in various parts of the United States.

Minnesota weeds, W. L. OSWALD and A. BOSS (*Minnesota Sta. Bul. 129, pp. 82, figs. 49*).—Following a brief general discussion of kinds of weeds, losses caused by them, how weeds are scattered, and learning how to know weeds, the nomenclature, description, and methods of eradication are taken up for each of the 24 most common Minnesota weeds, with illustrations of the 3 stages of seedling growth, enlarged seed, spikelet, and mature plant. A final table summarizes data as to the longevity, color of flower and seed, and the kind of field crop seed in which the weed seed was found for each weed.

HORTICULTURE.

New treatments for shortening the rest period of woody plants, II, F. JESENKO (*Ber. Deut. Bot. Gesell., 30 (1912), No. 2, pp. 81–93, pl. 1; abs. in Bot. Centbl., 120 (1912), No. 10, pp. 250, 251*).—The author extended the work done hitherto with alcohol and ether (E. S. R., 25, p. 641) to include experiments with hydrochloric, sulphuric, and phosphoric acids, 0.5 to 5 per cent; tartaric acid and alcohol, 1 to 30 per cent; saturated aqueous solution of carbon dioxid; and pure water; on twigs of *Pyrus malus*, *Larix decidua*, *Populus nigra*, *Sambucus nigra*, *Carpinus betulus*, *Acer campestre*, and *Salix aurita*.

Shortening of the rest period was obtained with the first three species named. This was decided when the treatment was applied early, as in November, and in such cases amounted to from 5 to 9 days. The effect of applying a high concentration for a short time was in a measure similar to that of a lower concentration employed during a longer time. The action of alcohol seemed much like that of the acids, though its nature is not yet explained. Further work is promised with other acids, also a further communication on the theoretical aspects of the facts observed.

The refoliation of trees or shrubs defoliated in summer, F. JESENKO (*Ber. Deut. Bot. Gesell., 30 (1912), No. 4, pp. 226–232, pl. 1; abs. in Bot. Centbl., 122 (1913), No 4, pp. 87, 88*).—Continuing the work noted above, the author carried out experiments with *Tilia grandifolia*, *Fagus silvatica*, *Quercus pedunculata*, *Sorbus torminalis*, *Carpinus betulus*, *Acer platanoides*, *A. pseudoplatanus*, *Forsythia suspensa*, and *Springa vulgaris*. The treatment of the defoliated twigs consisted in the injection of solutions of alcohol (1.5 to 10 per cent) or ether (0.1 to 1 per cent), or of water, or in wounding the buds either by clipping the end or by piercing.

C. betulus responded but weakly and *Q. pedunculata* rarely to the treatment, but in most cases the treatment of completely defoliated twigs was followed by refoliation, which was more ready and marked in case of the injections, particularly of the solutions. Of these, the weaker generally showed their results early, the stronger later in the season.

Carbonic-acid gas as a plant nutrient, H. FISCHER (*Gartenflora, 61 (1912), No. 14, pp. 298–307*).—The author describes experiments conducted with various greenhouse plants which tend to show that the development of both foliage and flowers is stimulated by increasing the carbonic acid content of the surrounding air. Suggestions are given for conducting practical tests of the beneficial effect of the gas in greenhouses and other confined spaces.

The relation of propagation to assimilation in the plant kingdom, H. FISCHER (*Sitzber. Gesell. Naturf. Freunde Berlin, 1912, No. 10, pp. 517–521*).—In connection with the above noted experiments the author found that second generation plants of *Tropæolum minus-peregrinum*, which very seldom produce seed, yielded some viable seed when stimulated with carbonic acid gas. The possibility of producing viable seed from other sterile forms by increasing the assimilation activities is suggested.

Keeping soft cuttings alive for long periods, G. W. OLIVER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 111, pp. 29–31, fig. 1*).—The author describes a simple method for successfully transporting cuttings of herbaceous plants from distant places. The necessary articles comprise 2 sheets of strong glass, 5 by 7 in. or larger, a small quantity of sphagnum moss, and some stout twine. A layer of cuttings is arranged without crowding with the upper surfaces of the leaves on the first piece of glass. Two or 3 in. of sphagnum moss are evenly distributed over the cuttings. Another layer of cuttings is then placed on the moss with the under surfaces of the leaves next to the moss. The second piece of glass is

then placed over the second layer of cuttings. The whole package is then pressed down firmly and tied together.

By keeping the moss moist and giving all the light possible, the cuttings will carry well, provided the material is free from fungus troubles. If the journey is a long one, the cuttings will have in many cases rooted freely while pressed against the glass. With the moss only slightly dampened, scions and bud sticks of rare plants keep a very long time in good condition under the same treatment.

Gardening indoors and under glass, F. F. ROCKWELL (*New York, 1912, pp. 210, pls. 31, figs. 9*).—A practical guide to the planting, care, and propagation of house plants, and to the construction and management of the hotbed, cold frame, and small greenhouse.

Fruits and vegetables under glass, W. TURNER (*New York, 1912, pp. 255, pl. 1, figs. 65*).—A practical treatise on the commercial greenhouse forcing of fruits and vegetables.

Making a garden with hotbed and cold frame, C. H. MILLER (*New York, 1912, pp. 62, pls. 8*).—A short treatise.

The horticulture in the Netherlands (*Netherland Dept. Agr., Indus. and Trade [Pamphlet], 1912, pp. 32, figs. 20*).—A statistical account of the various horticultural industries in Holland, including also information relative to the horticultural instruction and phytopathological service.

[Horticultural investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 228, pp. 16, 17*).—A brief statement of progress made in cultural experiments with cranberries and in testing new apples at the station.

At the station's cranberry bog, O. G. Malde in charge, insurance against injury from summer frosts has been practically secured by sanding the bog. A sanded bog withstood frost on 5 consecutive nights in June, whereas all of the surrounding bogs of the old type had to be flooded for protection. Considerable loss occurred on unsanded and unflooded bogs. The application of commercial fertilizers made to certain of the station plats several years ago (E. S. R., 27, p. 345) continues to show excellent results. Iron sulphate solution was used with success as a weed killer on new plantings and young vines. Two applications were sufficient to hold many of the troublesome weeds in check and retard grass growth.

Out of a number of apple seedlings which had been tested for several years, J. G. Moore reports that 3 appear to be worthy of testing out in the field. These are seedlings of McMahon, Walbridge, and Fameuse. Of the newer varieties of apples under trial Hydes King and Garfield seem suited to Wisconsin conditions and are being propagated for further dissemination.

The jack bean and the sword bean, C. V. PIPER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 29–36, pl. 1*).—A comparative account of the jack bean (*Canavali ensiformis*) and the sword bean (*C. gladiata*), relative to their distinguishing characteristics, history, botanical relationships, and economic value. A review of the literature on the genus shows that the 2 species have been frequently confused. The generic name Canavali likewise appears to have been erroneously modified by many authors to Canavalia.

A résumé is given of the attempts which have been made to utilize the jack bean as a stock feed in the South. Although the bean meal as tested at the Mississippi Station (E. S. R., 9, p. 168) has been found to be bitter and unpalatable, the successful utilization of the jack bean as green feed at the Hawaii Station (E. S. R., 25, p. 734) suggests that it may be found equally valuable as green feed in this country, especially in Texas and Oklahoma, where its great drought resistance gives it particular promise. In Porto Rico the jack bean has been found very useful as green manure and cover crops in citrus

orchards, and experimental tests in Florida indicate that it may prove equally valuable there.

The sword bean, which has been introduced into America at various times, is still cultivated almost entirely as a curiosity or as an arbor vine. Since it is commonly cultivated as a vegetable in many Asiatic countries, its value for this purpose in the Southern States is suggested. The half-grown pods are prepared for the table after the manner of snap beans.

Chicory culture, J. STORME (*Betterave, 22 (1912), Nos. 560, pp. 212, 213; 561, pp. 226, 227; 562, pp. 242, 243; 564, pp. 274–276; 565, pp. 290, 291; 566, pp. 307, 308; 567, pp. 322–324*).—This comprises a detailed account of the culture of chicory root used as a substitute and blending material for coffee.

Agriculture on the Truckee-Carson project.—Vegetables for the home garden, F. B. HEADLEY and V. FULKERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 21–25*).—This paper embodies the results of cultural tests of vegetables conducted for 3 years on the Truckee-Carson Experiment Farm. Information is given relative to the best varieties and special or little-known cultural methods.

Commercial truck crops on the Truckee-Carson project, F. B. HEADLEY and V. FULKERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 113, pp. 15–22*).—This paper discusses the present development of the potato, onion, celery, and melon industries on the Truckee-Carson irrigation project and gives estimates on the cost of growing some of these crops, together with cultural suggestions with especial reference to that section.

Fruit growing on the Truckee-Carson project, F. B. HEADLEY and V. FULKERSON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 118, pp. 17–28, figs. 7*).—This paper comprises popular suggestions for the culture and care of orchard fruits on the Truckee-Carson irrigation project. The subject matter is based on the literature of the subject and also on observations of the few orchards in that region.

Fruits recommended for planting in various parts of the Province of Ontario (*Ontario Dept. Agr. Bul. 211, 1913, pp. 12*).—A revision of Bulletin 179, previously noted (E. S. R., 23, p. 143).

Bartlett pear precooling and storage investigations in the Rogue River Valley, A. V. STUBENRAUCH and H. J. RAMSEY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 114, pp. 19–24*).—This paper describes investigations begun in the Rogue River Valley in 1912 to determine the possibility of extending or lengthening the usual Bartlett pear season of the Northwest in order to enable the bulk of the crop to reach eastern markets after the California season closes. Pickings were made at weekly intervals from 3 different orchards in sections representing 3 different types of soil. The effect of precooling before and after packing was tested in a local storage house. After withdrawal the various lots were placed in an ice refrigerator car for 12 days, the average time required for carlots to reach New York.

Although further study is necessary in order to determine the factors of seasonal influence which must be taken into consideration before all phases of the problem are solved, the results indicate that the season can be extended from 6 to 7 weeks by leaving the fruit on the trees 2 weeks longer than is at present practiced and by storing for 4 or 5 weeks at a temperature of 32° or 34° F. after the fruit has been precooled. The number of pickings should be sufficient to allow all the fruit to mature on the tree and the fruit should be promptly precooled after picking.

Olives in California, F. T. BIOLETTI (*California Sta. Circ. 86, pp. 4*).—A popular circular discussing the uses, climatic and soil requirements of olives,

propagation, grafting, care of orchards, pruning, harvesting, diseases, varieties, and pickling.

Modern strawberry growing, A. E. WILKINSON (*Garden City, N. Y., 1913, pp. X+210, pls. 31, fig. 1*).—A practical treatise on commercial strawberry culture, the information contained herein being based on all available literature on the subject.

Strawberry culture and the red raspberry, F. M. CLEMENT (*Ontario Dept. Agr. Bul. 210, 1913, pp. 28, figs. 18*).—This bulletin gives practical suggestions for growing strawberries and red raspberries, the information contained herein being based on a survey of practices employed by successful growers in Ontario.

The Himalaya blackberry, H. P. GOULD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 116, pp. 23–26*).—This comprises notes on the behavior of the Himalaya blackberry in the East and South, based on reports of cooperators, and including also tests made at Arlington Farm. Although this berry appears to be well adapted to the Puget Sound region in Washington and is of commercial importance in portions of California and elsewhere on the Pacific coast, its general usefulness and adaptability to conditions in a large portion of the country east of the Rocky Mountains, as indicated by the reports received, are very restricted. The plant appears to be hardy in the East but is nonproductive and the fruit inferior.

Sugar and acid content of American native grapes, W. B. ALWOOD (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [*Washington and New York*], *26* (*1912*), *Sect. VIa–XIb, App., pp. 33, 34*).—An abstract of the author's investigations on this subject (E. S. R., 26, p. 441). The results as a whole have shown that it is necessary to take into consideration methods of correcting the acidity of by-products made from the more acid varieties of grapes, except in the best years.

Reconstitution of Portuguese vineyards by means of American stocks, S. DO MONTE PEREIRA (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 4* (*1913*), *No. 1, pp. 3–7*).—A brief historical account of the reconstitution of vineyards in Portugal.

The hybrid producers in 1912, E. PÉE-LABY (*Jour. Soc. Cent. Agr. Haute-Garonne, 23* (*1913*), *No. 240, pp. 68–88*).—A further report on various direct bearing hybrid grapes with reference to their character, growth, and resistance to mildews, insect attacks, etc. (E. S. R., 26, p. 138).

Coconut culture, Part I, A. J. A. FREDHOLM (*West India Com. Circ., 27* (*1912*), *Nos. 363, pp. 411–414; 364, pp. 437–439; 365, pp. 461–464; 366, pp. 487, 488; 367, pp. 509–512; 368, pp. 533–535; 369, pp. 556–558; 370, pp. 580–582; 371, pp. 606–608; 372, pp. 631, 632; 28* (*1913*), *Nos. 373, pp. 5–7; 374, pp. 29–31; 375, pp. 53–55; 376, pp. 81–83; 377, pp. 103–106, pls. 3, figs. 18*).—This comprises a botanical study of the coconut palm. The subjects dealt with include the seed, germination of the seed, the trunk, the leaf, members and organs associated with reproductive activities, the systematic botany of the coconut palm, geographical distribution, and economic development.

Opportunities in pecan culture, C. A. REED (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 112, pp. 3–9*).—A discussion of the present status of pecan culture in the United States and the possibilities for the future development of the industry, based on replies to a letter of inquiry sent out to growers.

Shrubs and perennials adapted to ornamental gardening in Illinois with suggestions on propagation, A. M. AUGUSTINE (*Trans. Ill. Hort. Soc., n. ser., 46* (*1912*), *pp. 86–108*).—A tabular list of perennials and shrubs for planting in Illinois is given, including notes on their propagation.

Some Asiatic Actinidias, D. FAIRCHILD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 7–12, pls. 2, figs. 2*).—The author here calls attention to 5 species of Actinidias which are now grown to a limited extent in this country and are considered worthy of further dissemination as ornamental climbing shrubs. In their native environment the Actinidias are also valued for their fruit. Endeavors are being made by the Bureau of Plant Industry to improve fruiting forms in this country. Considering the wide range of climate to which the different species of this genus are adapted, the author suggests the genus as a valuable one for the hybridizer to work with.

Roses and rose gardens, W. P. WRIGHT (*London, [1912], pp. 294, pls. 48, figs. 9*).—A popular treatise on the culture and care of roses both outdoors and under glass, including also information relative to the history of the rose, types and classes of roses, propagation, and exhibits.

The National Rose Society's official catalogue of roses (*[Croydon, England, 1912], pp. 119*).—This comprises a descriptive catalogue compiled by the National Rose Society of England. Under the description of each variety are shown the class to which it belongs, its origin, color of the flower, character of growth, purpose for which best suited, and general notes. Selections of roses for various purposes are also given.

A new ornamental palmetto in southern Texas, O. F. COOK (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 113, pp. 11–14*).—In this paper the author calls attention to the occurrence of palmettoes in southern Texas, and especially to a form which is now growing at Victoria and the stock of which probably originated in Mexico. On account of the divergencies from the native forms, the Victoria palmetto is recognized as a new species for which the name *Inodes exul* is proposed. In view of the demonstrated hardiness and ornamental value of this species, seed has been planted at the United States Experiment Farm at San Antonio with a view to wider distribution in southern Texas.

Preparation of concentrated lime-sulphur solution on the farm, G. C. STARCHER (*Virginia Sta. Bul. 201, pp. 16, figs. 6*).—This bulletin gives the practical results secured in the home manufacture of concentrated lime-sulphur solution by various growers and also at the station. A suggested outfit for small commercial operations is also given, including a table of dilutions for dormant and summer spraying as recommended by the New York State Station (E. S. R., 24, p. 663), the cost of concentrated lime-sulphur solution, and analyses of various limes.

Direct fire heat and steam were of about equal value in cooking the material, both from the standpoint of cost and efficiency, but steam heat was much more easily controlled. Both burnt and hydrated lime were about equally effective, but the hydrated lime was easier to handle, kept longer without becoming carbonate, and gave a higher percentage of clear concentrate. Ground quicklime was found to be undesirable. The 50 : 100 : 50 formula gave best results and the 40 : 80 : 50 next, both being preferable to the 62½ : 125 : 50 formula. A homemade solution containing a proportion of sludge appears to be almost as valuable for spraying as a clear solution, providing it has been properly made. It is recommended, however, that commercial concentrated solutions should be free from sludge. Homemade concentrated lime-sulphur solution was found to cost about one-half as much as the commercially prepared at current prices. It required a little more care in its use since it is not generally as constant in strength as the best commercial brands.

Common orchard troubles, spray mixtures, and spray calendar, F. W. FAUROT (*Missouri Fruit Sta. Bul. 23, pp. 3–39, figs. 28*).—This bulletin illustrates and briefly describes some of the more common orchard diseases and insect pests, and suggests methods by which they may be controlled.

State crop pest law and rules and regulations of the commission (*W. Va. Crop Pest Com. Bul. 1, 1913, pp. 16*).—This bulletin gives the provisions of the act passed by the West Virginia legislature in 1913 to prevent the introduction and spread and to provide for the control of the San José scale and other dangerous insects and dangerously injurious plant diseases.

FORESTRY.

Review of Forest Service investigations (*U. S. Dept. Agr., Rev. Forest Serv. Investigations, 1 (1913), pp. 68, pls. 8*).—This is the first volume of a series of publications, designated by the above title, the purpose of which is to furnish periodically a résumé of the character and progress of the investigative work conducted by the Forest Service. Each issue is to contain brief accounts of the progress made on the more important studies whose completion may require several years and more detailed reports of minor projects whose publication in separate form is inadvisable. Similar material furnished by state foresters will also be published from time to time. Although the Review is published primarily for use within the Forest Service, it is expected that it will be valuable to professional foresters elsewhere and to investigators in closely allied fields of work.

The material in the present volume is discussed under the following general headings: Organization and scope of investigative work, description of the different lines of investigation, and the program of investigative work for 1912.

Forest conditions in the Rocky Mountains forest reserve, T. W. Dwight (*Dept. Int. Canada, Forestry Branch Bul. 33, 1913, pp. 62, figs. 19*).—This comprises the results of the author's investigation relative to the species of timber in the Rocky Mountains forest reserve of Canada, the effect of the methods of lumbering followed on their reproduction, and the extent to which natural reproduction has followed. Suggestions are also given relative to the management of timber cutting operations, together with some volume, growth, and yield tables based on measurements of trees felled in lumbering operations.

The climax forest of Isle Royale, Lake Superior, and its development, III, W. S. Cooper (*Bot. Gaz., 55 (1913), No. 3, pp. 189–235, figs. 25*).—A further account of various successions which have led up to the present forest on Isle Royale (E. S. R., 28, p. 643). A bibliography of the literature cited is appended.

Some observations on Hawaiian forests and forest cover in their relation to water supply, W. M. Giffard (*Honolulu, Hawaii, 1913, pp. 24*).—A paper on this subject, including also a list of tree seeds adaptable for planting in Hawaiian forests, with especial adaptation to altitude, climate, and soil conditions.

The forests of the Harz, past and present, A. Dengler (*Ztschr. Forst u. Jagdw., 45 (1913), No. 3, pp. 137–174, pls. 3, fig. 1*).—A historical study of forest conditions in the Harz Mountains.

State work in forest conservation (Eastern States), S. N. Spring (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26. (1912), Sect. VIa–XIb, App., pp. 777, 778*).—An abstract of a paper on this subject presented before the Eighth International Congress of Applied Chemistry, New York, September 9, 1912.

The conservation of forests by private landholders in the United States. O. W. Price (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sect. VIa–XIb, App., pp. 763–767*).—A discussion of the need of private conservation of forests in the United States for the maintenance of a timber supply.

Farm forestry, E. J. ZAVITZ (*Ontario Dept. Agr. Bul. 209, 1913, pp. 30, figs. 28*).—A revision of Bulletin 155, previously noted (E. S. R., 18, p. 942).

The use of fertilizers in the forest, KUHNERT (*Illus. Landw. Ztg., 33 (1913), No. 10, pp. 77, 78, figs. 2*).—Experiments in the use of commercial fertilizers in the culture of young forest trees are here briefly described.

Comparative action of magnesium sulphate and calcium sulphate on the germination of Maritime pine seed, L. CHANCEREL (*Rev. Eaux et Forêts, 52 (1913), No. 7, pp. 208, 209, fig. 1*).—Pot experiments were conducted in which the above chemicals were used at the rate of 0.25 kg. (8.8 oz.) to 10 kg. (22.05 lbs.) of sand. Seed was also grown in pure sand as a check.

From the standpoint of germination, both chemicals were superior to pure sand. Germination was quite general where either chemical was used but the young plants grew much more rapidly when fertilized with the calcium sulphate. The beneficial effect of magnesium sulphate appears to cease after the plants have reached a certain age and plant growth is stunted as compared with that of plants treated with calcium sulphate.

Illustrations of conifers, H. CLINTON-BAKER (*Hertford, 1913, vol. 3, pp. 89, pls. 72*).—A continuation of the series of life-size illustrations of the cones and foliage of conifers growing in the British Isles, supplemented by analytical keys to species and short, concise descriptions, previously noted (E. S. R., 22, p. 451).

The Chinese wood-oil tree, D. FAIRCHILD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 108, pp. 7, pls. 3*).—A description of the Chinese wood-oil tree (*Aleurites fordii*), including notes on its economic value, cultivation, production of oil, and possibilities of the wood-oil industry.

Previous distributions of the Chinese wood-oil tree have grown and fruited well on cheap land in various southern States and in California. The tree has done best in the more moist parts of the Gulf coast region, on deep loam soils which are underlain with stiff clay. The tree has not done well on the sticky gumbo soils of eastern Texas or on the almost pure sand soils of Florida.

The Chinese wood oil is used to a great extent in the varnish industry of the United States, and preliminary investigations indicate that there is no specific difference in the composition of oil of trees grown in China and in this country. Within the next year the Department will prepare to distribute 1-year-old trees for the special purpose of starting acre experimental plantations in the hands of private individuals.

Mechanical properties of woods grown in the United States (*U. S. Dept. Agr., Forest Serv. Circ. 213, pp. 4*).—This comprises a preliminary tabular summary with discussions of tests on small, clear, green specimens of 49 species of wood. The following tests were made: Bending, compression parallel and compression perpendicular to grain, hardness, shear parallel to grain, cleavage or splitting, and tension at right angles to grain. Information is also given on shrinkage, specific gravity, moisture content when tested, proportion of summerwood, and rate of growth or rings per radial inch.

The minute structure of the wood of Cupressus macrocarpa, W. S. JONES (*Quart. Jour. Forestry, 7 (1913), No. 2, pp. 108–117, pls. 2, figs. 5*).—A short illustrated study of the minute anatomy of the stem of *C. macrocarpa*.

Tests of packing boxes of various forms, J. A. NEWLIN (*U. S. Dept. Agr., Forest Serv. Circ. 214, pp. 23, figs. 4*).—The results of endwise-compression, diagonal-compression, and drop tests of various types of packing boxes are reported and suggestions given relative to changes in design indicated by character of failures.

The wood-using industries of Vermont, H. MAXWELL (*Dept. Agr. and Forestry Vt., Forestry Pub. 11, 1913, pp. 119, pls. 4*).—This bulletin reports a statistical study of the wood-using industries in Vermont, conducted by the Forest

Service of the U. S. Department of Agriculture in cooperation with the State. Data are given relative to the costs, kinds, and amounts of wood used in the State and the various uses to which each is put, together with information as to markets, general methods of manufacture, and the utilization of waste.

The development and status of the wood-preserving industry in America, E. A. STERLING (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 26 (1912), Sect. VIa–XIb, App., pp. 17–30*).—This comprises a summarized review of the developments and present status of the wood-preserving industry.

The efficacy of creosote oils in impregnated woods, R. NOWOTNY (*Österr. Chem. Ztg., 16 (1913), No. 7, pp. 91–95*).—A review of the present knowledge of this subject.

DISEASES OF PLANTS.

[Report of the division of plant pathology] (*Wisconsin Sta. Bul. 228, pp. 4–10, figs. 4*).—A summary is given of research work carried on in the department of plant pathology under the direction of L. R. Jones, assisted by R. E. Vaughan and A. G. Johnson. This consists largely of studies on pea blight, cabbage, tobacco, and barley diseases, and notes on a plant disease survey of the State.

In the study of pea blight several parasitic fungi were found associated with the disease, some of which are carried over in the pea stubble, and one was found to live in the seed itself. For the control of this disease spraying with Bordeaux mixture has given good results, but the rotation of crops and the use of healthy seed should be adopted where this plant is grown on a considerable scale.

The study of the cabbage diseases has been largely directed toward the breeding of resistant strains, and some have already been secured which produced 86 per cent of healthy plants as compared with 21 per cent of plants grown from commercial seed. Seed selected from some of the best strains gave 93 per cent of properly matured heads when grown in infected soils.

Studies of the tobacco diseases by J. Johnson have shown the desirability of sterilization of soil either with steam or formalin for the prevention of damping-off and for killing weeds. The black rot of tobacco, which often occurs during fermentation, has been conclusively shown to be due to the fungus *Sterigmatocystis nigra*.

Further investigations are reported on barley diseases, of which three forms have been determined as due to distinct species of fungi. Apparently the most serious one is that known as the leaf stripe, which is characterized by light-colored stripes on the leaves, which later turn gray and then brown. As the disease progresses the entire plant collapses. Formalin treatment of seed, as recommended for smut, has proved effective in controlling the leaf stripe, but is less effective against the leaf blotch.

Infection experiments with parasitic fungi, III, O. TREBOUX (*Ann. Mycol., 10 (1912), No. 6, pp. 557–563*).—In continuation of previous work (E. S. R., 28, p. 149), the author records the results of experiments carried out with several rusts to determine the possible hosts in each stage.

The genus Synchytrium, GERTRUD TOBLER (*Arch. Protistenk., 28 (1913), No. 2, pp. 141–238, pls. 4*).—A monographic study is given of the genus Synchytrium, together with notes on the morphology, cytology, and biology of the species, their influence on the host plants, and geographic distribution. Fifty-one species are recognized by the author and 12 considered of doubtful validity. The monograph concludes with an index of host plants and an extensive bibliography.

The life history of Ascochyta on some leguminous plants, R. E. STONE (*Ann. Mycol., 10* (*1912*), *No. 6, pp. 564–592, pls. 2*).—The author is here concerned chiefly with *A. pisi*. This widely known and economically important fungus is claimed to be identical with *Sphærella pinodes*, which is said to be its perfect stage. *S. viciæ* is held to be the perfect form of the Ascochyta occurring on *Vicia villosa*. The author also describes a Mycosphærella, found on *Melilotus* spp., claimed to have been undescribed hitherto, which he names *M. lethalis* n. sp. A bibliography is appended.

Sempervivum rust, E. WERTH (*Centbl. Bakt.* [*etc.*], *2. Abt., 36* (*1913*), *No. 15–18, pp. 395–409, pl. 1, figs. 3*).—This is a study of the abnormalities of growth produced by *Endophyllum sempervivi* on this host. The fungus is said to live perennially therein and to induce leaf deterioration and an abnormal axial extension of the lateral shoots, which is otherwise seen only under unfavorable conditions of growth. Illustrations and descriptions are given of other changes observed, and a bibliography is appended.

Some new species of Fusarium on cereals, A. DE JACZEWSKI (*Bul. Trimest. Soc. Mycol. France, 28* (*1912*), *No. 4, pp. 340–348, figs. 4*).—The author has made an attempt to limit some of the species of Fusarium that have commonly been reported as *F. roseum* occurring on cereals. In addition to *F. roseum*, he reports on maize the following species: *F. maydis*, *F. heterosporum*, *F. graminum*, and *F. zeæ*. *F. neglectum* is described as a new species.

A study of loose smut, W. OETKEN (*Deut. Landw. Presse, 40* (*1913*), *Nos. 4, pp. 35–37; 5, p. 49*).—This is an account of experiments carried out under the author's direction in 1912, with results as follows:

The percentage of attack by loose smut was reduced considerably below that attained in 1911 by the hot-water treatment, but its use appears to be attended with danger to the qualities of the wheat as seed. The germinability in soil seed beds is lower than that in dishes filled with sand, but figures for the former only are given. Long immersion in water softens the seed and decreases its power of resistance, and is not recommended.

Seed soaked in water at from 15 to 20° C. for 72 hours gave a germination of only 94 per cent and no perceptible lowering of the smut attack, whereas grain soaked at from 20 to 25° for 60 hours gave 96 per cent germination and a considerable decrease of attack, and portions soaked at from 35 to 40° for 22 hours gave a germination of 94 per cent and no attack from loose smut. This last also gave the highest water content obtained, 46.8 per cent. All seeds were carefully dried at room temperature before planting.

Complete freedom from loose smut with a germination of 97 per cent was obtained by a first soaking at 25° for 4½ hours, followed by 48° for 30 minutes. Freedom from attack with a germination of 95 per cent followed treatment at 25° for 3½ hours, and at 50° for 15 minutes. Treatment at 25° for 4½ hours and 50° for 5 minutes gave a germinability of 97 per cent and no infection. In these three experiments the water content after treatment was much less than in those where one long treatment was employed, though still about three times that of the grain before treatment.

It is stated that the water treatment for loose smut, according to these experiments, is not adapted to stinking smut which was also sometimes present. A second treatment is said to increase considerably the danger to the seed grain. See also a previous note (E. S. R., 28, p. 547).

Influence of stinking smut on the form of wheat heads, E. SPERLING (*Illus. Landw. Ztg., 32* (*1912*), *No. 87, p. 793*).—Illustrations and figures are given in support of the statement that the ears of squarehead wheat attacked by stinking smut grow longer and more slender, and are of looser structure than the normal heads. Bearded wheat, which, however, is said to be less subject to

attack from the smut, is also stated to undergo change of form and structure in a less degree.

Flag smut of wheat, J. T. PRIDHAM (*Agr. Gaz. N. S. Wales, 24 (1913), No. 1, pp. 25, 26*).—A brief account is given of some experiments to determine the relation of the condition of the seed bed to infection by flag smut (*Urocystis occulta*).

There was apparently found a direct relation between a dry seed bed at the time of sowing the grain and infection, since both the spores and the seed germinated together when the later rains came. Where the seed bed was moist the fungus in many instances had germinated before the sowing of the wheat and comparativly little infection followed. Early-maturing varieties in general are said to be most liable to attacks of this fungus, and some of these varieties show marked difference in susceptibility.

The practical value of the corrosive sublimate treatment for seed grain, L. HILTNER (*Illus. Landw. Ztg., 32 (1912), No. 93, pp. 849, 850*).—Continuing work previously noted (E. S. R., 25, p. 652), the author reports that further tests in treating seed grain with 0.1 per cent mercuric chlorid have resulted in favorable reports from several quarters. In one case the use of the sublimate gave a stand ten times as great as that obtained from the seeds not so treated.

Can corrosive sublimate as protection against fungi on seed grain be superseded by chinosol or other means? G. GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 11 (1913), No. 1, pp. 6–12, fig. 1*).—The author discusses comparative experiments made by him, claiming that the results show considerable superiority of the sublimate solution over that made with chinosol or formalin. See also a previous note (E. S. R., 27, p. 351).

A disease of maize in Cochin China, E. GRIFFON, ALI RIZA, ET AL. (*Bul. Trimest. Soc. Mycol. France, 28 (1912), No. 4, pp. 333–338, pls. 2*).—This is an account of a disease of maize previously described by Foex and Berthault (E. S. R., 28, p. 150).

The bean blight and preservation and treatment of bean seed, C. W. EDGERTON and C. C. MORELAND (*Louisiana Stas. Bul. 139, pp. 43, pls. 6*).—A description is given of bean blight due to *Pseudomonas phascoli* or *Bacterium phaseoli*. The course of the disease in the plant, resistance of bacteria to drying, and the results of inoculation experiments are described at some length.

The bacteria attack the leaves and pods, producing dead spots on the leaves, which often spread until the entire leaf is killed On the pods watery appearing spots may be seen which often spread over a considerable area of the surface.

The studies show that the bacteria remain alive on the bean seeds from harvest until planting time and again affect the young plants as the seeds germinate. The bacteria in the laboratory were found very resistant to drying, some of the experiments showing that they had remained alive for over 200 days when dried on cover glass slips. The period of incubation of the disease, as shown by inoculation experiments, is from 6 to 12 days.

Experiments for the control of the disease by proper preservation of the bean seed indicate that if beans of the spring crop are carefully selected, thoroughly dried, fumigated to keep out weevils, and then preserved in air-tight containers, the amount of the disease will be materially reduced. Seed thus treated and carefully preserved germinates as well as northern-grown seed, gives as good a stand, and is much freer of blight than purchased seed. As the bacteria may live over in the seed, it is recommended that before planting the seed be treated with benetol or corrosive sublimate solutions.

On a special cultural practice for control of Orobanche on beans, A. MORETTINI (*Staz. Sper. Agr. Ital., 45 (1912), No. 8, pp. 598–614*).—Experiments were

carried out to test the effects of deep planting, etc., on Orobanche parasitic on beans.

It is said that deep seeding neither diminished the percentage of attack nor decreased the severity of the injury. Tests made with associated cultures of Leguminosæ gave negative results, as the presence of the roots of barley and oats did not hinder the germination of Orobanche seeds. Late planting seems to have increased the yield by limiting germination of the seeds of the parasitic plant.

Fungus diseases of beets in Sweden, J. ERIKSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet, 1912, No. 63, pp. 30, figs. 9; K. Landtbr. Akad. Handl. och Tidskr., 51 (1912), No. 6, pp. 410–437, figs. 9*).—Illustrated descriptions and remedial measures are given for a number of the more injurious diseases affecting sugar beets in Sweden. Among the diseases mentioned are beet rust (*Uromyces betæ*), yellows (*Bacillus tabificans*), root rot (*Rhizoctonia violacea*), heart rot, leaf spot (*Cercospora beticola*), and a form of heart rot due to *Sporidesmium putrefaciens*. In the author's opinion, these diseases are probably transmitted through the seed, and a careful inspection of fields used for seed production is recommended.

Leaf scorch disease of celery, T. G. B. OSBORN (*Jour. Dept. Agr. So. Aust., 16 (1912), No. 4, pp. 402–405, figs. 5*).—Celery leaves affected with leaf scorch, received from Mount Gambier, were examined at the South Australian Department of Agriculture. Illustrations and a brief description are given of the disease and of the fungus causing it, *Septoria petroselini*, which has recently become widespread in the United Kingdom.

The fungus persists from season to season in dead leaves and stalks. The spores germinate when moist and infect the next crop. The fruits or seed balls are often infected and may cause a fresh outbreak on hitherto clean ground. A successful field treatment is said to be spraying with dilute Bordeaux mixture or with a solution of potassium sulphid, 1 oz. to 3 gal. water. Ventilation and dryness in the storehouse, destruction of the refuse from an infected crop, and the purchase of fungus-free seeds are recommended as preventive measures.

Clover sickness (*Jour. Bd. Agr. [London], 19 (1913), No. 11, pp. 928–930, pl. 1*).—Clover sickness, which has often been attributed to soil exhaustion, is claimed to be due to definite parasites and attacks of nematodes. *Tylenchus devastatrix* and *Sclerotinia trifoliorum* are said to be among the most common causes of the failure of clovers to grow.

Fungus staining of cotton fibers, A. MANN (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 27, 28*).—Attention is called to the fact that occasionally brightly colored threads appear in white cotton cloth, which are due apparently to the presence of fungi in the bolls. An examination was made of a cotton boll the lint of which was a brilliant carmine red, and it was found that the color was due to the presence of a fungus belonging to the genus Fusarium. *F. metachroum* is known to occur on various host plants in the United States and under alkaline conditions may be highly colored. It is thought possible that from the observed facts the phenomenon described above may be due to this organism.

A consideration of the physiology and life history of a parasitic Botrytis on pepper and lettuce, G. L. PELTIER (*Missouri Bot. Gard. Ann. Rpt., 23 (1912), pp. 41–74, pls. 5*).—A study was made of peppers attacked by *B. cinerea* and of the relation between this fungus and that causing the drop or damping off of lettuce.

The author concludes that *B. cinerea* is the imperfect stage of *Sclerotinia fuckeliana* and that it is a degenerate form, having lost the apothecial stage

entirely. His investigations seem to indicate that there is no connection whatever between *S. fuckeliana* and *S. libertiana*. Two stages in the parasitism of the fungus have been recognized, first, the killing of the cells in advance of the fungus, due to some organic acid or toxin secreted by the fungus, and second, the digestion of the dead tissue by a number of enzyms which are produced in varying quantities by it. A bibliography is given.

Fusarium leaf roll of potato, W. HIMMELBAUR (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 41 (1912), Nos. 5, pp. 716–744, figs. 13; 6, pp. 944–976, figs. 15*).—Besides a brief historical account of the theories of a fungus origin of potato leaf roll and of its production by a physiological weakening, the author gives a report on his own studies, also a theoretical discussion of the results, with conclusions substantially as follows:

Discoloration of the vascular bundles occurs in both infected and uninfected plants. Mycelium of Fusarium may appear in any part of the plant and may be flourishing or else declining, sometimes even in a vestigial condition, being weakened presumably by the defensive counteractivity of the host plant. The fungus may obstruct the vessels of the host, so hindering transportation as to cause a weakening that may persist for several generations.

The anatomical study of plants showing leaf roll and discoloration, but free from mycelium, is thought to support the view that such plants are descended from typical infected plants, weakened by the fungus. A study of those showing leaf roll but no mycelium or discoloration gave no definite conclusions, but it is thought that these may exhibit the last stages of the disappearing injury handed down from infected ancestors. All these indications are held to point back to a typical leaf roll condition, including both mycelium and discoloration, and to the struggle between fungus and host; this struggle resulting in the forms observed, of which many combinations occur in correspondence with conditions of soil, culture, climate, etc. Some varieties, as Magnum Bonum, Up-to-Date, etc., appear to retrograde easily in their power of resistance to leaf roll.

It is asserted that mycelium of Fusarium artificially introduced into a plant is capable of further development there. Insect or other subterranean injuries may offer favorable points of attack to the fungus in the soil. Predisposition may also play an important part.

The employment of uninfected seed tubers and soil and the breeding of resistant varieties are recommended.

A very extensive bibliography is appended.

Potato leaf roll, W. A. ORTON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 109, pp. 7–10*).—A description is given of a disease of potatoes that has become quite destructive in portions of the Rocky Mountain region. It was first thought to be an aggravated form of some of the diseases already known, due to Rhizoctonia, stem blight, or Fusarium, but it is now considered identical with the leaf-roll disease common in Europe.

The definite cause of the leaf roll is as yet unknown, and no satisfactory remedy has been discovered. The author recommends control measures, such as good seed, crop rotation, and improved culture, as of importance in securing a better growth of this crop.

Powdery dry rot of the potato, W. A. ORTON (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 110, pp. 13–15*).—A brief account is given of the powdery dry rot of potatoes, which has been recently described as due to *Fusarium trichothecioides* (E. S. R., 27, p. 650). On the basis of the life history of the fungus, the author suggests possible means of control, which include the use of clean seed, rotation of crops, and care in storing the potatoes. Considerable losses

are reported in tubers which have been sacked and held for some weeks before forwarding to market. Such potatoes, stored in large piles, offer conditions favorable for the development of the fungus. It is suggested, when it is necessary to hold potatoes before shipping, and it is not feasible to put them into storage cellars, that they be kept unsacked in the field in low piles covered with sufficient earth to protect them from sun and frost.

Results of spraying for Irish blight, G. SEYMOUR (*Jour. Dept. Agr. Victoria, 10 (1912), No. 12, pp. 745–752*).—Tests were carried out at several centers to ascertain whether on the whole it pays to spray potatoes for late blight in the dry climate of Australia. Burgundy mixture, made up of 12 lbs. copper sulphate and 15 lbs. of sodium carbonate to 100 gal. of water, was used from one to four times at the rate of from 80 to 100 gal. per acre, the larger quantity being employed when the plants were large and well grown.

It is stated that spraying checks the disease and results in a larger percentage of sound tubers, the increase being in proportion to the number of sprayings, and the proper number being determined by the weather conditions. Four sprayings gave tubers entirely free from late blight. However, it is also said that spraying checks the growth of the crop, decreasing the total yield in proportion to the number of sprayings. From these experiments it is concluded that spraying did not pay, but the season is said to have been unfavorable for the development and spread of the disease. The question is raised whether the copper-lime mixture made up of 10 oz. of copper sulphate, lime-water 8½ gal., and water 41½ gal., which proves as effective and is cheaper, is not better adapted to use for late blight in Australia.

Control of the black rot and stem rot of the sweet potato, L. L. HARTER (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 114, pp. 15–18*).—According to the author, several papers on sweet potato diseases are in preparation, but in order that advantage may be taken of control measures a preliminary report is given of methods by which the black rot (*Sphæronema fimbriatum*) and stem rot (*Fusarium batatatis*) may be controlled. These consist of seed selection, the proper care of the hotbed, including steam sterilization or treatment with a solution of formaldehyde, and crop rotations.

The perfect stage of the Ascochyta on the hairy vetch, G. F. ATKINSON (*Bot. Gaz., 54 (1912), No. 6, pp. 537, 538*).—The author reports having found on pods of the hairy vetch affected with Ascochyta a number of perithecia which proved to belong to the genus Sphærella. These pods had been covered during the winter and in the early spring taken into the laboratory, where the perfect form of the fungus was observed. The germination of the ascospores was studied, and inoculation experiments seemed to confirm the connection observed between the two forms of the fungus. A more detailed account of the investigation is to be published later.

Note on a new treatment for silver-leaf disease in fruit trees, SARAH M. BAKER (*Ann. Bot. [London], 27 (1913), No. 105, p. 172*).—A preliminary account is given of experiments in which hypodermic injections of a concentrated water extract from the fruiting bodies of Coprinus were made in plum trees affected by the silver leaf. This is based on the phenomenon of autodigestion shown by the fruiting bodies of most species of Coprinus. The results are believed to be so encouraging as to warrant the continuation of the experiments on a larger scale and to extend the treatment to other fungus diseases of plants and animals, and also to investigate the precise nature of the enzym in Coprinus and its effects.

The Jonathan fruit spot, W. M. SCOTT and J. W. ROBERTS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 112, pp. 11–16, figs. 2*).—Subsequent studies and spraying experiments have convinced the authors that the fruit spot described in

1911 (E. S R., 24, p. 744) is not due to arsenate of lead nor to a specific organism, but that it is probably a physiological trouble, falling in the same category as bitter pit or Baldwin spot. It is stated that early picking, prompt cold storage, and immediate consumption after removal from storage will largely obviate losses from this disease.

A fungus disease of Prunus padus new in Germany, A. LINGELSHEIM (*Mitt. Deut. Dendrol. Gesell., 1911, No. 20, p. 393; abs. in Mycol. Centbl., 2 (1913), No. 2, p. 104*).—The author found numerous young shoots and leaves of *P. padus* from Silesia to be attacked by *Monilia linhartiana*, said to have been known before only in Hungary, Belgium, and parts of North America.

A preliminary report of a nematode observed on citrus roots and its possible relation with the mottled appearance of citrus trees, E. E. THOMAS (*California Sta. Circ. 85, pp. 14, figs. 8*).—A study has been begun of a species of nematode which has not before been described as occurring on citrus trees, with a view to determining its possible association with the disease known as mottled leaf.

An examination of citrus trees in a number of counties in southern California showed that where the condition of the tree was badly mottled in nearly every instance nematodes were found numerous on the roots. Out of 300 specimens examined but two exceptions occurred.

A preliminary study was made to learn the exact relation which the nematode bears to the roots in order to ascertain the relationship between the occurrence of the nematode in the roots and the unhealthy condition of the orange trees.

A description of the nematode occurring on the orange roots is given. Unlike many nematodes, it does not seem to form galls on this host plant.

Infectious chlorosis of citrus trees, L. TRABUT (*Compt. Rend. Acad. Sci. [Paris], 156 (1913), No. 3, pp. 243, 244*).—A description is given of a form of chlorosis of citrus trees which the author claims is readily transmitted through grafts.

Diseases of the agave, R. RAMIREZ (*Bol. Dir. Gen. Agr. [Mexico], Rev. Agr., 1 (1912), No. 1, pp. 56–60, pls. 3*).—Illustrations and very brief discussions are given of diseases affecting the agave and of 11 fungi supposed to cause them. Insects are said to assist the fungi in their attack on this plant. Copper compounds are said to control the superficial fungi. Avoidance of excessive humidity and soil sanitation are recommended.

The American gooseberry mildew in Sweden, J. ERIKSSON (*Deut. Obstbau Ztg., 57 (1911), No. 25, pp. 407–409; abs. in Ztschr. Pflanzenkrank., 22 (1912), No. 8, p. 484*).—It is stated that within the last 5 years the so-called American gooseberry mildew has become widely distributed in Sweden, threatening the culture of the gooseberry in that region. Destruction of all affected plants is the only remedy mentioned.

Treatment of court noué, L. RAVAZ (*Prog. Agr. et Vit., (Ed. l'Est-Centre), 34 (1913), No. 3, pp. 68, 69*).—The author quotes a portion of a report made by G. Bertrand on his experiments carried out in continuation of those previously noted (E. S. R., 27, p. 250). It is stated that the results obtained in 1911–12 from the use of various chemical compounds applied to plants affected with court noué were either negative or very slight as to control of the disorder.

Control of Peronospora by spraying the underside of the leaves, P. KULISCH (*Landw. Ztschr. Elsass-Lothringen, 40 (1912), p. 389; abs. in Mycol. Centbl., 2 (1913), No. 1, p. 47*).—This is a discussion of investigations regarding the alleged fact that attack of grapevines by *Plasmopara (Peronospora) viticola* occurs only on the underside of leaves, as claimed by Müller-Thurgau (E. S. R., 28, p. 54), and of treatment suited to that condition.

Control of powdery mildew (Oïdium tuckeri), J. Moder (*Tirol. Landw. Bl., 1912, p. 220; abs. in Mycol. Centbl., 2 (1913), No. 2, p. 106*).—The author states that in Tyrol good results followed the employment of 10 per cent copper sulphate solution as used against *O. tuckeri*.

Contributions on roncet of grapevines, E. Pantanelli (*Ztschr. Pflanzenkrank., 23 (1913), No. 1, pp. 1–34, figs. 8*).—The author gives a continuation of a series of investigations (E. S. R., 28, p. 245) regarding the relation of roncet to various agencies and conditions. An early spring dwarfing of the grapevines with recovery in summer was investigated, and a progressive change in chemical composition was established. It is stated that these depend upon a form of bud modification and may be produced by such factors as late frost, improper nourishment, insect injury, etc. Roncet was not definitely connected with insect or fungus parasites, with thermolabile poisons, or with wound-gum formation, and it is considered questionable whether it depends upon the action of cold. The recovery of some stunted branches was found to correspond to a new development of absorbing roots. Soil and root relations, it is thought from results obtained, may prove significant in this connection.

On Marssonina kirchneri n. sp., G Moesz (*Magyar Bot. Lapok [Budapest], 11 (1912), No. 1–4, pp. 12–18, fig. 1; abs. in Bot. Centbl., 120 (1912), No. 12, p. 308*).—It is claimed by the author that fungus material, similar to that studied by D. Hegyi on *Anethum graveolens* (E. S. R., 27, p. 354) and named by him *M. kirchneri*, is really composed of two fungi, *Phoma anethi* and *Fusicladium depressum petroselini*.

A stem-rot disease of carnations due to a species of Fusarium, C. J. Wight (*Pomona Col. Jour. Econ. Bot., 2 (1912), No. 3, pp. 315–336, pls. 4, figs. 11*).—An account is given of a study of a disease of carnations which was found to be due to a species of Fusarium, and the relation of the disease organism to *F. oxysporum* is discussed.

Field observations confirmed the conclusions of Mangin (E. S. R., 13, p. 154) regarding the characteristics of the disease. The fungus primarily attacks the stems, causing a rot, and its presence in affected plants may be recognized by the wilted, yellowish, drying condition of the foliage, with a softened condition of the stem at the surface of the ground.

The fungus was isolated and grown on various media, and inoculation experiments demonstrated its pathogenic nature. In its cultural and morphological characters the carnation Fusarium differs from *F. oxysporum*. It was found capable of invading carnation plants through wounds and causing disease, but it is not believed capable of causing injury to sound plants through soil infection. The disease is said to be widely distributed but not very injurious in the locality studied.

For the control of the disease the author recommends the use of cuttings from healthy plants, change of soil from year to year, protection against extreme heat and moisture, and care against injury to plants in transplanting.

Uromyces hyalosporus, a cause of the disease of shoots of Acacia confusa, K. Sawada (*Bot. Mag. [Tokyo], 27 (1913), No. 313, pp. 16–20, figs. 6*).—The author describes under the name *U. hyalosporus* a new species of fungus, which is said to attack the young shoots of *A. confusa* in Formosa, where this tree is extensively planted for avenue, ornamental, fuel, timber, and other purposes. The fungus also occurs in nurseries and proves very destructive to the young trees. The uredosori appear in great numbers on the phyllodia, often coalescing and finally killing them. On large trees both the pods and phyllodia are often infected.

The biology of maple leaf spot ascribed to Rhytisma acerinum, K. Müller (*Centbl. Bakt. [etc.], 2. Abt., 36 (1912), No. 1–5, pp. 67–98, pls. 4, figs. 4*).—The

author amplifies a previous report (E. S. R., 27, p. 853), giving results which are in brief as follows:

Acer platanoides is attacked by a specialized form of *R. accrinum*, which attacks less markedly the other two species of maple investigated, and is named *R. acerinum platanoides*. *A. pseudoplatanus* is attacked by a clearly differentiated fungus named *R. pseudoplatani* n. sp. *A. campestre* is attacked by a form which only lightly attacks these other two maples and is called *R. acerinum campestris*. These differentiations were established by observations and infection studies both in the open and within glass cases. In the infection studies attack occurred almost exclusively on the lower leaf surfaces where stomata abound. The only exceptions occurred where the epidermis was broken. A close relation was found to exist between the violence of attack and precipitation when the spores were ripe. The incubation period is subject to great variations, related to warmth and moisture of the air. There seems to be a sort of self-regulation as to the violence of attack. The spores, which are said to have been inexactly figured heretofore, are single celled and possess a gelatinous envelope. They are transferred mainly by air currents.

The occurrence of the oak mildew in Alsace-Lorraine, J. Killer (*Naturw. Ztschr. Forst u. Landw., 11 (1913), No. 2, pp. 110, 111*).—Notes are given on the occurrence of the powdery mildew on the oak in Alsace-Lorraine, the fungus having first been noticed in 1909.

Suppression of white pine blister rust disease, A. F. Hawes (*Ann. Rpt. State Forester Vt., 4 (1912), pp. 21–24*).—According to the author, in 1909 a considerable supply of white pine nursery stock was imported from Germany that was subsequently found to be infected with the white pine blister blight (*Peridermium strobi*). As soon as this was discovered an attempt was made to examine and destroy all infected plants. In 1910 about 1 per cent of the trees were destroyed as a means of protection, and in 1911 and 1912 additional inspections were made. The season of 1911 was unfavorable to the disease on account of severe drought, but in 1912 the orange fruiting bodies were conspicuous on infected trees, so as to be readily distinguished.

A summary is given of the inspections made of the different plantations.

Epiphytes on the soap-nut tree (Sapindus emarginatus), C. Balayya Nayudu (*Indian Forester, 39 (1913), No. 1, pp. 1–5, pl. 1*).—The author describes an epiphytic orchid found growing abundantly on the soap-nut tree in parts of India. The roots of the plant were found not to penetrate the tissues of the host, but formed a network about the stems and branches, gripping the tree so firmly that the circulation of sap through the cambium was prevented. Ultimately this resulted in a condition known as stag-head in many of the trees of the region.

Experiments were carried on to determine remedies, and it was found that where the epiphytes were cut out from the trees the succeeding season showed good growth. The economic employment of this means depends upon the cost of the labor.

Studies on Pleurotus ostreatus and P. ulmarius, C. D. Learn (*Ann. Mycol., 10 (1912), No. 6, pp. 542–556, pls. 3*).—This is a study of *P. ostreatus* and *P. ulmarius* as representatives of the Agaricaceæ in relation to wood destruction. Besides descriptions of these forms, a discussion of their chemical composition and biological relations and behavior is given, also of the chemical and physical changes caused by each in several woods commonly attacked. A bibliography is appended.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game laws for 1912, T. S. PALMER, C. E. BREWSTER, and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 510, pp. 48, figs. 2*).—This publication, contains the thirteenth annual summary of the game laws of the United States and Canada, and is on the same general plan as those issued previously (E. S. R., 26, p. 245).

Fifty common birds of farm and orchard (*U. S. Dept. Agr., Farmers' Bul. 513, pp. 31, figs. 50*).—This publication has been prepared with a view to enabling farmers and their boys and girls to identify the birds that frequent the farm and orchard. Brief accounts of the range, habits, and economic status, with colored illustrations, are given for 50 of the more common species.

Autohemorrhage or the ejection of blood in insects, A. C. HOLLANDE (*Arch. Anat. Micros., 13 (1911), No. 2, pp. 171–318, pls. 3, figs. 41*).—This paper deals at length with the blood of insects as used for protective purposes.

The subject is divided into 4 parts. The first deals with the historical side of the question; the second with the examination of liquids ejected by insects and their comparison with the blood of these insects to demonstrate the sanguineous nature of the liquids, etc.; the third part with the chemistry and toxicology of the blood emitted by insects; and the fourth with various considerations on the manifestations which accompany autohemorrhage. An extensive bibliography is appended.

Injurious and beneficial insects of California, E. O. ESSIG (*Mo. Bul. Com. Hort. Cal., 2 (1913), No. 1–2, pp. XXXI+367, figs. 321*).—This work, treating of the insects of the most economic importance known to occur in California, has been prepared in response to requests for information received by the State Commission of Horticulture.

Report of the entomologist of the Arizona Horticultural Commission for the year ending June 30, 1912, A. W. MORRILL (*Ariz. Hort. Com. Ann. Rpt., 4 (1912), pp. 15–43, pl. 1, figs. 11*).—The first part of this report relates to the details of inspection work, including the introduction of beneficial insects, and part 2 with the occurrence of the more important insects during the year.

The eastern peach borer was found to be established in 2 places in the State; and the common eastern bagworm was discovered in one locality. The injury to navel oranges by the orange thrips ranged from nothing to as high as 60 per cent, the average of scarred fruit being about 25 per cent. The fire ant (*Solenopsis geminata*) is said to have been the source of much injury in the Salt River Valley during the summer and fall of 1911, particularly to a navel orange orchard planted the previous spring. *Cicada cinctifera* was found to be capable of inflicting serious injury to young citrus trees. *Epilachna corrupta*, which is the source of considerable damage to the bean crop each year, made it necessary to replant several acres of beans in one locality.

Twenty-seventh report of the state entomologist on the noxious and beneficial insects of the State of Illinois, S. A. FORBES (*Rpt. State Ent. Ill., 27 (1912), pp. XVII+143, figs. 101*).—This report consists of 4 papers, namely, What is the Matter with the Elms in Illinois? by S. A. Forbes (pp. 1–20); On Black Flies and Buffalo Gnats (Simulium) as Possible Carriers of Pellagra in Illinois, by S. A. Forbes (pp. 21–55); Insects Injurious to Stored Grains and Their Ground Products, by A. A. Girault (pp. 56–82); and Report on Insects Injurious to Flowering and Ornamental Greenhouse Plants in Illinois, by J. J. Davis (pp. 83–143), the first and third of which have been previously noted from other sources (E. S. R., 27, p. 255; 28, p. 57).

In the paper on Simulium the author includes descriptions of the general features of the life history of the Illinois species. The species occurring in the

State, notes on which are presented, are *Simulium bracteatum*, *S. hirtipes*, *S. johannseni* n. sp., and *S. venustoides* n. sp., descriptions of both of which by C. A. Hart are included, *S. meridionale*, *S. pecuarum*, *S. pictipes*, *S. venustum*, and *S. vittatum*. A paper, previously noted (E. S. R., 28, p. 560), on the Simulium pellagra problem in Illinois contains much of the data here presented. A bibliography of the American and English articles consulted is appended.

The more important insects attacking flowering and ornamental greenhouse plants discussed include the variegated cutworm (*Peridroma margaritosa*), the southern fern cutworm (*Callopistria floridensis*), the rose or oblique-banded leaf roller (*Archips rosaceana*), the greenhouse leaf tyer (*Phlyctænia ferrugalis*), the diamond-back moth, the Alternanthera worm (*Hymenia perspectalis*), the rose midge (*Neocerata rhodophaga*), the garden flea hopper (*Halticus citri*), 10 species of aphids (*Macrosiphum sanborni*, *Aphis rufomaculata*, *A. gossypii*, *M. rosæ*, *Myzus rosarum*, *Myzus persicæ*, *Myzus vincæ*, *Rhopalosiphum* (?) *nymphææ*, *Idiopterus nephrelepidis*, and *A. maidiradicis*), several coccids (the tessellated palm scale [*Eucalymnatus tessellatus*], the soft scale, the hemispherical scale, the pineapple scale [*Diaspis bromeliæ*], the rose scale, the fern scale, the box scale [*Pinnaspis buxi*], the Camellia scale [*Fiorinia fioriniæ*], *Aspidiotus cyanophylli*, the Latania scale [*A. lataniæ*], the oleander scale [*A. hederæ*], the greedy scale, the circular or Florida red scale [*Chrysomphalus aonidum*], the chaff scale, and *Parlatoria proteus*), the greenhouse white fly, the orchid Isosoma (*Isosoma orchidearum*), a new fern-asparagus and smilax root borer (*Scolopendrella immaculata*), the carnation bud rot and the mite (*Pediculopsis graminum*) accompanying it, and the foliar eelworm (*Aphelenchus olesistus*).

Two insects which attack the cork oak and alfalfa, I. V. Clarió-Soulán and J. N. Comas (*Barcelona: Serv. Agron. Nac. Prov. Barcelona, 1911, pp. 12*).—This paper deals with the gipsy moth and its injury to the cork oak, and the chrysomelid beetle *Colaspidema atrum*, which is the source of serious injury to alfalfa, with means for combating them.

Preliminary report on the more important insects of the truck gardens of Illinois, J. J. Davis (*Ann. Rpt. Ill. Farmers' Inst., 16 (1911), pp. 216–263, figs. 42*).—This paper, based upon observations in northern Illinois extending over a period of 3½ years, deals with the more important insect enemies of truck gardens and means for their control.

[Work with cranberry insects in 1912], H. J. Franklin (*Ann. Rpt. Cape Cod Cranberry Growers' Assoc., 25 (1912), pp. 31–51*).—This is the author's annual report of observations and work with cranberry insects.

The total injury is said to have been greater than usual, it having been a serious fruit worm year and the blackhead cranberry worm or fireworm the source of greater and more general injury than for many years. The cranberry spanworm caused serious injury for the first time in many years, having destroyed all of the leaves on the greater part of one bog at Yarmouth. The scale insect (*Aspidiotus oxycoccus*), previously mentioned as a source of injury, almost entirely disappeared during 1912. Reference is made to correspondence in regard to injury by spittle insects to cranberries on Long Island.

The experimental work during the year was confined mostly to the cranberry fruit worm and blackhead cranberry worm or fireworm, with observations on the cranberry girdler (*Crambus hortuellus*), a somewhat extended discussion of which is presented.

Insects and diseases of cassava in Cuba, P. Cardin (*Estac. Expt. Agron. Cuba Bol. 20, 1911, pp. 30, pls. 8*).—Brief accounts are given of the insect enemies (pp. 5–26) and diseases (pp. 26, 27) of *Manihot utilissima* in Cuba with remedial measures therefor. *Dilophonota ello*, *Lagochirus obsoletus*, and *Lonchæa chalybea* are said to be the most important insect enemies of this

plant. Other insects mentioned as enemies are *Lepidosaphes alba*, *Tetranychus bimaculatus*, *Leptostylus biustus*, *Pachnæus litus*, *Atta insularis*, and *Criptocephalus commutatus*.

Some of the more important insects affecting our farm animals, W. H. DALRYMPLE (*Amer. Jour. Vet. Med., 8 (1913), No. 1, pp. 1–10, figs. 4*).—This paper deals with some of the more important insect enemies of domestic animals in this country.

The grape leafhopper, F. Z. HARTZELL (*New York State Sta. Bul. 359, pp. 31–51, pls. 6, figs. 3*).—This bulletin deals with studies by the author of the hibernating habits and spring food plants of the grape leafhopper and with experiments conducted with a view to the establishment of efficient spraying practices in continuation of the work previously noted (E. S. R., 27, p. 157).

Fence rows, woods, brush and waste land, weeds or situations where leaves have been accumulated by the wind were found to be the most favorable hibernating places. Grass which has lodged also affords winter shelter to the insects. The drier, well-drained soils are more conducive to the safe wintering of the adults than the heavier soils. "The foliage of raspberry, strawberry, blackberry, currant, gooseberry, catnip, Virginia creeper, burdock, beech, and sugar maple is eaten by the grape leafhopper before it migrates to the foliage of the grape. Strawberry and raspberry are the preferred spring food plants. The insects migrate from the strawberry to the raspberry during early May and from the raspberry to the grape during the latter part of May. . . . The foliage of the grape is injured by the overwintering adults, but most of the feeding is restricted to the lower leaves, especially those on the young shoots or suckers at the base of the vine."

Spraying experiments carried on during 1912 with a view to testing out the recommendations made in the bulletins previously noted showed (1) that black leaf 40, 1 part to 1,600 parts of water or Bordeaux mixture, is an efficient spray for the leafhopper; (2) that the automatic attachment is a practical machine in the hands of careful sprayers; and (3) that the fruit from vines protected from the leafhopper is superior to fruit from vines subjected to the attacks of this pest. Chemical analyses of grapes from sprayed vines gave a gain of from 8 to 68 per cent in sugar over those from untreated vines, while the unsprayed grapes had from 0 to 20.6 per cent more acid than sprayed grapes.

"The destruction of hibernating places of the grape leafhopper is recommended as a method of control, especially to save the young foliage of the grape in the spring. When hibernating adults are on the young foliage, delaying the removal of the young shoots at the base of the vine will tend to keep the insects on the lower leaves and thus afford some protection to the more permanent foliage. The lower shoots should be removed just previous to spraying."

Controlling grape leafhoppers in 1912, F. H. HALL (*New York State Sta. Bul. 359, popular ed., pp. 4, pls. 2, fig. 1*).—A popular edition of the above.

The corn root aphis in Illinois, S. A. FORBES (*Illinois Sta. Circ., 1913, Jan. 9, pp. 7*).—This circular calls attention to the way in which the knowledge of the life history and habits of the corn root aphis may be taken advantage of in successfully combating it. In combating this insect all infested corn fields of the preceding year must be plowed to a depth to turn out the nests of the ants, or from 6 to 7 in., and must then be repeatedly disked as nearly as possible to the depth of the plowing in a way to break up the nests and to scatter their contents so thoroughly that the ants will fail to find them and bring them together again. In order to make it as difficult as possible for these

active underground insects to search the earth, the soil should be packed with a heavy roller after the last disking is done.

A supplementary method consists in the use of oil of tansy as a repellent. The most successful method of application is said to be as follows: "Take 100 lbs. of bone meal for each acre of the land to be treated, and moisten this by sprinkling and stirring until the fluid is very equally distributed, with ¼ lb. of oil of tansy and 1 gal. of denatured alcohol or wood alcohol, whichever may be the cheapest and most convenient. Put this mixture into the fertilizer-dropper and plant with the corn."

As regards rotation it is pointed out that a corn field of 1 year sowed to oats the next may easily breed enough winged root lice in early spring to infest the corn of a neighborhood, and that it thus becomes much more dangerous to corn than if it were continued in that crop after being deeply plowed and thoroughly disked.

The structure and biology of Schizoneura lanigera, or woolly aphis of the apple tree, Part I, J. Davidson (*Quart. Jour. Micros. Sci. [London], n. ser., 58 (1913), No. 232, pp. 653–701, pls. 5, figs. 4*).—This first part deals with the apterous viviparous female.

Investigations of jaundice of silkworms, S. von Prowazek (*Centbl. Bakt. [etc.], 1. Abt., Orig., 67 (1912), No. 4, pp. 268–284, pls. 2, fig. 1*).—This paper presents a brief review of investigations of this disease, reports investigations conducted by the author in 1912, discusses the nature of the polyhedral bodies, and etiological investigations.

The fruit-tree leaf roller in Colorado, C. P. Gillette and G. P. Weldon (*Off. State Ent. Colo. Circ. 5, 1912, pp. 44, figs. 27*).—The orchard experiments here reported in detail have led to the following conclusions:

"The leaf roller eggs may be killed by a very thorough spraying with a soluble oil while the trees are dormant. This spray should probably be applied prior to but as near hatching time of the eggs as possible. Very careful and heavy spraying with arsenicals early in the season will result in almost complete control. The first application should be made shortly after the eggs begin to hatch, which will be when the first green foliage is showing on the trees, and the second as soon as the blossom buds have separated in the clusters. A blossom spray is, in all probability, not necessary and is dangerous in that it poisons the bees.

"Black leaf 40, carefully and thoroughly applied about the same dates as the first two sprayings with arsenicals, will give good results. A mixed spray of black leaf 40 and lead arsenate is little more satisfactory than either one of the insecticides used alone. Furthermore, the cost of such a spray would be too great for practical purposes. Three lbs. of lead arsenate to 50 gal. of water is sufficient for successful control, and there is no advantage to be derived from mixing Paris green with it as many have done. Not less than 10 gal. of spray on an average should be applied to trees from 12 to 20 years of age. Very large trees may require even more.

"Failure to control this pest with arsenicals has been due in most cases either to a failure to spray early enough and at the correct time, or to put enough of the liquid on the trees."

Catalogue of the Lepidoptera Phalænæ in the British Museum.—XI. Catalogue of the Noctuidæ in the collection of the British Museum, G. F. Hampson (*London, 1912, vol. 11, pp. XVII+689, pls. 18, figs. 275*).—This continuation of the work previously noted (E. S. R., 25, p. 557) deals with the noctuid subfamilies Eutelianæ, Stictopterinæ, Sarrothripinæ, and Acontianæ, which include nearly 1,000 species arranged in 150 genera.

An insect injurious to maize in Russia (Botys silacealis), J. STRIELZOV (*Khoziaistvo, 1912, Nos. 37, pp. 1196–1202; 38, pp. 1224–1228; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2767, 2768*).—The lepidopteron *B. silacealis* is said to have become a most important enemy of maize during the past few years. In the district of Bakumut the percentage of plants attacked increased from 20 in 1909 to 90 in 1912.

The eggs are deposited in large numbers on the leaf blades about the middle of June and the larvæ upon hatching out bore into the stalks and the axes of the inflorescences and feed on the medullary tissues. The full-grown larvæ hibernate in the long galleries which they make in the stems and pupate in the spring. In addition to maize these insects frequently attack hemp and millet, the plants injured having very weak stems which are readily broken; the ears are irregularly developed, the caryopses usually become abortive, and the whole plant withers.

Good results are said to have been obtained by uprooting the plants after harvest and burning them in the autumn and spring.

The larch case bearer (Coleophora laricella), G. W. HERRICK (*New York Cornell Sta. Bul. 322, pp. 39–54, figs. 11*).—This is a report of studies of the biology of the larch case bearer which have extended over a period of 2 years.

This insect of European origin was first recorded in this country in 1886 from Massachusetts, where it is thought to have been introduced on the European larch. It is now widely distributed in northeastern United States, including New York and New England, and has been recorded in the vicinity of Ottawa, Canada, and from New Brunswick and Nova Scotia.

In the spring the larva sheds its skin and migrates from the branches on which it has passed the winter in its case to the buds. It eats a tiny hole through the epidermis of the leaf and mines out the inside tissues of the leaf as far on each side of the entrance opening as it can reach. The attacked leaves soon assume a bleached, whitened appearance and when deserted by the larvæ they shrivel and curl. In the spring of 1912 the larvæ lived on the growing buds for nearly 10 days before they were able to find leaves long enough to cut off and fasten to their cases. The larva pupates within the case, this stage lasting from 14 to 20 days. At Ithaca in 1911 the moths were appearing by May 24 and oviposition commenced a week or 10 days after emergence. The eggs are laid indiscriminately on the upper and under sides of the leaves. Upon hatching the larva bores directly through the floor or bottom side of the eggshell and thence through the epidermis of the leaf into the inside. They live within the leaves, gradually enlarging their mines until September. In 1910 they began to emerge from their burrows in the larch leaves and to make their winter cases during the first half of September. After making their winter cases they feed for 3 or 4 weeks before migrating from the leaves and entering hibernation.

Three parasites were reared at the station, one a species of Pteromalidæ of the tribe Pteromalini, the second a species of Pachyneuron, and the third probably belonging to the genus Tetrastichus.

No practical method of control is known for this case bearer on forest trees over large areas, but it can be controlled on trees used for ornamental purposes. Experiments carried on showed lime-sulphur solution diluted at winter strengths to be very effective in killing the case bearers while in hibernation. The experiments with lead arsenate lead the author to state that he does not feel justified in recommending its use.

A bibliography of the larch case bearer is appended.

Lime-sulphur wash an inefficient ovicide for codling moth, V. I. SAFRO (*Jour. Econ. Ent., 5 (1912), No. 5, pp. 385–395*).—In this paper the author

reports a preliminary series of experiments conducted during the fall of 1911, which have led to the conclusion that lime-sulphur, even too strong for use on foliage and fruit, is at best an uncertain ovicide and its effectiveness of doubtful value economically.

Arthrocnodax occidentalis n. sp., E. P. FELT (*Jour. Econ. Ent., 5 (1912), No. 5, p. 402*).—This dipteron was reared from larvæ found preying on red spiders (*Tetranychus* sp.) at Berkeley, Cal., an account of which by H. J. Quayle has been previously noted (E. S. R., 28, p. 457).

Sciara sciophila larvæ congregating in chains, J. S. HOUSER (*Jour. Econ. Ent., 5 (1912), No. 5, p. 399*).—The author records a serious outbreak of this dipteron on a lawn of about 1½ acres in extent at Cleveland, Ohio.

A new enemy of the fig in Brazil (Hilipus bonelli), G. BONDAR (*Chacaras e Quintaes, 6 (1912), No. 3, pp. 7, 8; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2776, 2777*).—In addition to *Azochis gripusalis*, commonly known as "lagarta," which destroys the buds and young fruit, and *Trachyderes thoracicus*, the larvæ of which tunnel galleries in the trunks, the author finds *H. bonelli* to be an important enemy of the fig (*Ficus carica*) in Brazil. It is said to kill the trees through its boring in the trunks and branches. The author recommends as a remedy spraying with carbolineum, and as a preventive measure the removal and destruction of the diseased trunks and branches.

The lime twig borer, H. A. BAILOU (*Agr. News [Barbados], 12 (1913), No. 284, pp. 90, 91*).—Toward the end of the year 1912, limes in a district in Antigua were found to be suffering from the attack of a new pest. Investigations by the author in December showed a small longicorn beetle (*Elaphidion mite*) to be the source of the injury. The attack on a lime branch apparently always begins in a small twig, the egg being laid on such. Upon hatching the larva eats out this small branch and after entering the larger one, girdles it in such a manner that it breaks off and hangs in the tree or falls to the ground. Remedial measures consist in the cutting off of the branches attacked and their destruction, together with the fallen branches, at intervals of one month. Recent information indicates that it is of fairly general distribution throughout the Leeward Islands.

Root borers and other grubs in West Indian soils (*Agr. News [Barbados], 12 (1913), Nos. 285, pp. 106, 107; 286, p. 122; 287, pp. 138, 139; 288, pp. 154, 155*).—A brief review of the subject.

A weevil enemy of cotton, KRÄNZLIN (*Pflanzer, 8 (1912), No. 12, pp. 692–695, pl. 1*).—The weevil (*Xanthostylum* sp.) previously reported by Morstatt (E. S. R., 26, p. 351) as attacking squares of cotton was observed at Morogoro, German East Africa, in June, 1912, to be a source of injury, more particularly through boring in the stalk at the crown.

Investigations of the structure and biology of Lymexylonidæ, especially Hylecoetus dermestoides, F. GERMER (*Ztschr. Wiss. Zool., 101 (1912), No. 4, pp. 683–735, pls. 2, figs. 31*).—The author finds that the larvæ of *H. dermestoides* remain in this stage for more than a year. They do not feed on the wood of the trees in which they bore, but on the spores of a fungus, *Endomyces hylecoeti*, found in the tunnels.

The North American digger wasps of the subfamily Scoliinæ, O. C. BARTLETT (*Ann. Ent. Soc. Amer., 5 (1912), No. 4, pp. 293–340, pls. 2*).—The author recognizes 2 genera and 19 species of this subfamily as occurring in North America, of which 3 are described as new to science.

The life history of Tetrastichus asparagi, H. M. RUSSELL and F. A. JOHNSTON (*Jour. Econ. Ent., 5 (1912), No. 6, pp. 429–433*).—This parasite of the

asparagus beetle, previously observed at Amherst, Mass., by H. T. Fernald (E. S. R., 23, p. 765), was studied by the authors at Riverhead, Long Island, N. Y., where it was present in asparagus fields in large numbers.

The egg is deposited in the egg of the asparagus beetle and the larva develops in and emerges from the larva or pupa of the beetle. Large numbers of the eggs of the asparagus beetle are destroyed through the puncturing and feeding of the adult parasite. "A number of adults that were observed in the field and in the laboratory were found to occupy from 1½ minutes to 23½ minutes in puncturing and feeding on a single host egg. Thirteen females that lived an average of 7.8 days during their life time destroyed by feeding 260 eggs of the asparagus beetle, or an average of 20 each at the average rate of 2.5 per day. The largest number of eggs destroyed by a single female was 61 and the largest number destroyed in a single day was 12."

Thus far the authors have only observed reproduction to take place asexually, no males having been reared during the course of 2 successive generations. In rearing this parasite, from 1 to 9 adults emerged from a single host larva. The parasite appears to pass through 3 generations a year in Long Island.

It is of considerable economic importance, more good apparently resulting from its habit of feeding so energetically on the eggs than by its parasitic development.

Notes on the biology of Chelonus texanus, W. D. Pierce and T. E. Holloway (*Jour. Econ. Ent., 5 (1912), No. 6, pp. 425–428*).—The authors find that the adult (*C. texanus*) deposits its eggs in the eggs of its hosts (*Heliothis obsoleta* and *Laphygma frugiperda*) but that the parasite does not emerge from the host's egg but from the larva which develops therefrom. The species is said to be a single and simple parasite.

[Work with parasites and wilt disease in combating the gipsy and brown-tail moths] (*Ann. Rpt. State Forester Mass., 9 (1912), pp. 70–85, pls. 2*).—These pages include a report on the work with insect parasites during 1912, by L. O. Howard (pp. 70–73), a discussion of the present status of wilt disease or flacherie, by W. M. Wheeler (pp. 73–75), and a report on work with the fungus disease, by R. H. Colley (pp. 75, 76). It is stated that on the most conservative estimate, over a considerable territory centering a little to the northward of Boston, 1 out of every 2 eggs, caterpillars, or pupæ of the gipsy moth was destroyed by imported parasites in 1912.

The occurrence of the citrus red spider, Tetranychus mytilaspidis, on stone and pomaceous fruit trees in Oregon, H. E. Ewing (*Jour. Econ. Ent., 5 (1912), No. 5, pp. 414, 415*).—This paper records the occurrence of *T. mytilaspidis*, the well-known red spider of citrus fruits in southern California, on deciduous fruits in Oregon, where during the summer it becomes very injurious by sapping the juices from the leaves and causing them to become pale or spotted and to curl up around the edges. Remedial measures consist of the use of summer sprays similar to those recommended for it in California. It is pointed out that lime-sulphur is not a satisfactory winter spray for the eggs, although it will at times destroy 60 or 70 per cent of the larvæ after they have emerged.

The life history and habits of Cheyletus seminivorus, H. E. Ewing (*Jour. Econ. Ent., 5 (1912), No. 5, pp. 416–420*).—This acarid, frequently observed in stored grain or grain products, is not an enemy to seeds of any kind or to stored grains but is entirely carnivorous in its diet. The young prefer to live upon the eggs of other mites and are of economic importance through holding in check mite enemies of stored grain.

FOODS—HUMAN NUTRITION.

Chemical and bacteriological study of fresh and frozen New Zealand lamb and mutton, A. M. WRIGHT (*Jour. Soc. Chem. Indus., 31 (1912), No. 20, pp. 965–967*).—The carcasses of a freshly slaughtered lamb and sheep were split, portions of the lean meat were removed from one-half of each carcass for analysis, and the other halves were held in cold storage at a temperature of from 2 to 19° F., the changes taking place in them being studied by analyses at different times during a period of 160 days.

The nature of the changes due to putrefaction, which occurred in suspensions of the finely minced fresh lamb and mutton in water inoculated with infusions from putrefying meat, showed the earlier stages of the putrefactive process to be characterized by the transformation of the insoluble into soluble proteins and the conversion of coagulable proteins into proteoses, peptones, meat bases, and ammonia, while the later stages were marked by the formation of simpler compounds such as ammonia, carbonic acid, and water.

The changes occurring during the ripening of fresh meat in the absence of bacterial influence were determined in samples to which thymol and chloroform were added to prevent bacterial growth, and consisted in an increase of organic extractives, total soluble nitrogen, meat base nitrogen, and proteose and peptone nitrogen. These changes were complete in from 3 to 5 days.

The chemical changes which took place in the portions kept in cold storage were only slight and of the same nature as those taking place during the ripening of the fresh meat, and like them were due probably to the action of enzyms, three of which, peroxidase, catalase, and one similar to trypsin were isolated from both the lamb and the mutton. The maximum change was reached in the lamb in about 60 days and in the mutton in about 105 days. There was a slight loss of moisture, the acidity of the fat remained unchanged, and the nutritive value of the meat was unaltered during storage.

Bacteriologically, the lamb and mutton were in the same condition after storage as the fresh meat; the surface was infected with bacteria but the interior remained sterile. It was found by experiment that when kept at a temperature of from 60 to 70° the surface bacteria could invade the interior of the lamb in 5 days and the interior of the mutton in 7 days, but no bacterial growth or invasion took place at a temperature of from 2 to 19°.

Mutton an economical meat (*Amer. Food Jour., 8 (1913), No. 1, p. 7*).—A collection of mutton recipes is given.

Data on the preparation of ham, PAUTET (*Hyg. Viande et Lait, 6 (1912), No. 5, pp. 249–258*).—Different methods of curing ham are described.

Concerning the preparation of tripe, sausage, and other meat goods, P. GODBILLE (*Hyg. Viande et Lait, 6 (1912), Nos. 1, pp. 1–11, figs. 8; 2, pp. 82–91, figs. 11; 3, pp. 151–161*).—Methods are described and other data summarized.

A chemical and bacteriological study of eggs, W. G. TICE (*Ann. Rpt. Bd. Health N. J., 35 (1911), pp. 275–295, fig. 1*).—This is a discussion of the results of a chemical and bacteriological examination of some eggs of known history, which seemed to indicate that eggs laid under clean conditions and stored in cases in a warehouse, in such a manner as to be protected from dirt and excessive moisture, can be kept for as long as 10 months without showing appreciable evidence of putrefactive decomposition.

Some useful native plants of New Mexico, P. C. STANDLEY (*Ann. Rpt. Smithsn. Inst., 1911, pp. 447–462, pls. 13*).—A number of useful food plants are described, among them being several edible cacti, the pulp of one of which is candied and eaten extensively.

Mushrooms and toadstools, W. A. SETCHELL (*California Sta. Circ. 84, pp. 4*).—The distinguishing marks of edible fungi, unreliable tests, and similar questions are considered in this popular summary of data.

As regards nutritive value, "in general, it may be said that even the most nutritious toadstools are of little nutritive value but are valuable as food accessories or condiments, not, in any wise, as substitutes for the meat or vegetable ordinarily consumed."

Report to the local government board on the nature of the coloring matter of flour and its relation to processes of natural and artificial bleaching, G. W. MONIER-WILLIAMS (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., 1912, No. 73, pp. 10, pl. 1, fig. 1*).—The coloring matter of flour was found to be identical with the vegetable pigment carrotene ($C_{40}H_{56}$).

This substance loses its characteristic orange color by the absorption of nitrogen peroxid, with which it reacts vigorously. On exposure to the air it is also decolorized by the absorption of oxygen. Since the substances formed are different in each case, it would appear that flour which is bleached artifically with nitrogen peroxid is not exactly the same as that bleached by natural aging.

The reason why bread grows stale, J. R. KATZ (*Pharm. Weekbl., 49 (1912), No. 52, pp. 1183–1219, figs. 8; Chem. Weekbl., 9 (1912), No. 52, pp. 1023–1058, figs. 8*).—From the results of an extended investigation, which included microscopic studies, the following conclusions were drawn:

When stored under adequately high temperature (50 to 90° C.), bread remains fresh for an indefinite length of time, provided that disturbing bacterial processes may be prevented. The fresh condition of the bread is shown not only by its consistency but also by analytical differences which distinguish fresh from stale bread. The value of these criteria was demonstrated in an extensive series of tests.

Storing bread at a moderately low temperature (0 to 20°) caused it to become stale. At a very low temperature, the rate of change was so small that the bread remained fresh.

The changes which bring about staleness take place in the starch grains, and involve a decrease in the water-absorbing capacity of the starch. The condition of bread protein, so far as known, is not influenced by this factor.

Through a decrease in their power of expansion or of swelling, the starch grains were reduced in size by a loss of water which was taken up by the proteid bodies. The softening of the crust of stale bread is due to the absorption of water.

The principles of two technical methods of preventing staleness in bread are reported.

The paper is followed by a brief discussion. For earlier work, see a previous note (E. S. R., 27, p. 764).

Increasing use of corn foods (*Amer. Food Jour., 8 (1913), No. 1, pp 5, 6, figs. 3*).—In this article on the use of corn a description is given of the manufacture of flaked corn breakfast foods and other corn products.

Rice in the dietary of the diabetic, H. STERN (*Med. Rec. [N. Y.], 81 (1912), No. 26, pp. 1219–1222*).—In connection with data concerning the use of rice by diabetics, some information regarding its general use is given, as follows:

"Rice, i. e., the 'polished' product of commerce, furnishes substantially nothing to the organism besides an easy digestible starch. Given in suitable amounts this starch is practically all absorbable and ready to serve as a calorifacient.

"The commercial cereal is therefore peculiarly adapted to supply carbohydrates without any protein or mineral admixture of consequence.

"This deficiency of protein and mineral substances makes rice an indifferent food so far as the formation of toxic protein products and useless or impossible pancreatic, cardiac, and renal activities are concerned."

The identification of Russian honey, E. J. SARIN (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 3, pp. 131–144*).—Analytical data are reported and discussed.

Greek honey, E. I. EMMANQUEL (*Geōrgikon Deltion, 2. ser., 2 (1912), No. 7, pp. 289–346*).—Analyses of 17 samples of Greek honey are reported and discussed with special reference to the characteristics and quality of such goods.

Fruit jams, A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 244, 1912, pp. 25*).—This report contains the tabulated results of the analysis of 158 samples and the official standards for fruit products.

Candy—cheap and expensive, C. H. LAWALL (*Amer. Jour. Pharm., 85 (1913), No. 1, pp. 13–18*).—Information is given regarding the manufacture and adulteration of candy, and some of the dangers of cheap candies are pointed out.

Carbonated beverages and ice creams (*Maine Sta. Off. Insp. 45, pp. 181–192*).—This report contains the results of analyses, made in accordance with the state pure food law, of carbonated beverages, ice creams, and cream used for ice cream making, together with a discussion.

Copper in cocoa and chocolate, C. FORMENTI (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 3, pp. 149–154*).—On the basis of analytical data presented, the author concludes that copper does not occur in any considerable quantity in cocoa.

The use of vegetable ivory for making a coffee adulterant, F. E. NOTTBOHM (*Ztschr. Untersuch. Nahr. u. Genussmtl., 25 (1913), No. 3, pp. 144–149, fig. 1*).—Data are given regarding the composition of this material and the dry matter which it contains before and after roasting, together with information regarding its use as a coffee adulterant.

The food and drug laws of the State of New Hampshire, with rules and regulations for the enforcement of the same as promulgated by the state board of health (*Concord, N. H., 1912, 2. ed., pp. 69*).—The text of the New Hampshire pure food laws and the rules and regulations for their enforcement are given.

Report of food and drug inspection, C. D. HOWARD (*Quart. Bul. Bd. Health N. H., 2 (1913), No. 1, pp. 6–17*).—In this report of the examination of a number of miscellaneous food and drug products, data are given regarding the character and extent of coffee adulteration observed, and a description of a product designed as an egg substitute, which was found to consist principally of corn and wheat starch colored in imitation of egg and "in no true sense a substitute therefor."

Report of the division of food and drugs, R. B. FITZ-RANDOLPH (*Ann. Rpt. Bd. Health N. J., 35 (1911), pp. 219–274*).—An account of the work of the division, with recommendations as to legislation. Special reference is made to the state cold storage law and its enforcement, and to an investigation of the oyster and clam beds.

Report of the food commissioner, E. F. LADD (*North Dakota Sta. Rpt. 1910, pt. 2, pp. 271*).—The results of the examination of a number of samples of miscellaneous food products and beverages under the provisions of the state pure food law and the reports of the analytical work of the division of food chemistry, the pharmacy division, and the sanitary inspection work are presented, and a number of topics relating to the general subject are discussed.

A brief report is made of a study of a new flour adulterant, so-called "enzym flour," and of a study of canned tomatoes, and a summary of milling and baking tests with wheat of different sorts (E. S. R., 22, p. 465) are included also.

Proceedings of the sixteenth annual convention of the Association of American Dairy, Food and Drug Officials (*Proc. Assoc. Amer. Dairy, Food and Drug Officials, 16 (1912), pp. 322*).—This volume contains the reports and proceedings of the meetings and other similar data together with papers presented. Among others are the following: Methods of Organization for Food Control Work, by L. Davies; Relative Toxicity of Substances Found in Foods, by A. N. Cook; the Arrangement of a Food Laboratory, by H. M. Loomis; Apparatus for the Determination of Fat by the Rose-Gottlieb Method, by W. Brinsmaid; Interpretation of Vinegar Analyses, by T. J. Bryan; and Formic Acid in Food Products, by F. L. Shannon.

The Florida tropical cook book (*Miami, Fla., 1912, pp. 224, fig. 1*).—This collection of recipes is especially interesting since it includes such fruits as the avacado, mango, papaw, and other tropical or subtropical fruits, as well as more common foods.

Standard cookery, N. Soyer (*New York, 1912, pp. X+436, pls. 9*).—A large collection of recipes. An index is provided.

Standard paper bag cookery, Emma P. Telford (*New York, 1912, pp. 156*).—A collection of recipes for paper bag cookery and of menus containing such dishes.

General directions for this form of cookery are given as well as a table of time required. In the author's opinion, paper bag cookery is much facilitated by the use of specially prepared wooden cooking utensils into which the food is placed before it is put in the bags.

Institution recipes, Emma Smedley (*Media, Pa., 1912, rev., pp. IX+248*).—As the subtitle states, this volume (E. S. R., 16, p. 901) was prepared for use in schools, colleges, hospitals, and other institutions. According to the author, it has been entirely revised, and a number of new recipes have been added, as well as chapters on the administration and equipment of school lunch rooms.

Practical flavoring extract maker, E. J. Kessler (*New York, 1912, pp. 84, figs. 4*).—This volume, designed for manufacturers, contains data regarding the making of extracts, adhesives, household ammonia, and similar goods.

Inquiry into the cost of living in New Zealand, 1910–11, J. W. Collins (*Wellington Dept. Labor, 1912, pp. 29*).—This gives the results of a study of the budgets of families of workingmen in the 4 principal cities of the country.

Some points to be considered in the planning of a rational diet, Susannah Usher (*Univ. Ill. Bul., 9 (1912), No. 32, pp. 15*).—In connection with this discussion the author gives menus for a man weighing 154 lbs., which supply varying amounts of protein and energy. Menus are also given which illustrate the work done by a class at the University of Illinois, using 4 simple foods, namely, beef, potatoes, cabbage, and apples, as the principal food constituents.

Feeding experiments with fat-free food mixtures, T. B. Osborne, L. B. Mendel, and Edna L. Ferry (*Jour. Biol. Chem., 12 (1912), No. 1, pp. 81–89, figs. 6*).—A study is reported of the growth of white rats which were fed on a fat-free diet consisting of isolated and purified proteins, starch, sugar, and "protein-free milk" (the latter being thoroughly extracted with ether).

The rats showed a normal rate of growth during almost the entire period during which growth ordinarily continues. The authors conclude that these results give positive evidence of the dispensableness of true fats for growth.

Maintenance experiments with isolated proteins, T. B. Osborne, L. B. Mendel, and Edna L. Ferry (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 233–276, figs. 21*).—Previous experiments by the authors and other workers are reviewed and criticised, and the value of maintenance experiments together with the important factors to be considered are discussed. The results of a large number of additional experiments are given in which laboratory animals were

maintained successfully on foods containing a single purified protein (e. g., casein, edestin, and gliadin) for long periods, and in many cases for periods equal to practically the entire adult life of the animal.

The rôle of gliadin in nutrition, T. B. OSBORNE, L. B. MENDEL, and EDNA L. FERRY (*Jour. Biol. Chem., 12 (1912), No. 3, pp. 473–510, figs. 26*).—This work was carried on to throw some light on the question as to whether or not proteins similar in composition to those making up the animal body are more valuable than those of dissimilar composition.

The maintenance, growth, and reproductive power were studied in rats which were fed on a diet in which gliadin furnished the sole source of nitrogen. Gliadin has a constitution very different from the proteins of animal tissue, as well as from most of the other proteins which are commonly present in the food of a man and animals, and would be unlikely to yield amino acids "building stones" in proportions corresponding to those obtained from proteins of animal origin.

Full-grown rats which were fed on the gliadin diet for nearly 300 days showed no ill effects from it, thus giving "evidence that, so far as maintenance is concerned, the protein of the food can differ very widely in its amino acid make-up from the tissue proteins of the animal without affecting the well-being of the latter." When growing rats were fed on the gliadin diet they failed to continue to grow, but when the gliadin was replaced with an "adequate" protein they resumed growth even in some cases at a period of life when rats normally have ceased to grow.

Two rats which had been kept on the gliadin diet for nearly 5 months were paired, and the female produced healthy offspring, which she nourished satisfactorily for a month. At the end of this time 3 of the young rats were given a normal diet while 1 was given the gliadin diet. The former exhibited a normal growth, while the latter, forced to depend on the gliadin food mixture, showed the typical failure to grow on the "inadequate" diet upon which the mother had not only been maintained but had actually produced young and secreted milk sufficient to induce normal growth in her offspring. The authors conclude "that in this experiment, in which there has unquestionably been a renewal, or new formation, of body tissue . . . there must have occurred a synthesis not only of the 'Bausteine' deficient in protein intake, but likewise of tissue and milk components," which were completely missing in the food of the mother and that synthesis in animal nutrition is here demonstrated in a striking manner.

Complex compounds of iron salts, hydrogen peroxid, and albumin—a contribution concerning the rôle of iron in biological oxidation, F. RÖHMANN and T. SHMAMINE (*Biochem. Ztschr., 42 (1912), No. 4, pp. 235–249*).—A discussion and experimental data are included.

Information concerning the compounds of iron salts with albumoses, F. RÖHMANN and T. SHMAMINE (*Biochem. Ztschr., 42 (1912), No. 4, pp. 250–254*).—Several experiments are described.

Contributions to the physiology of the stomach.—II, The relation between the contractions of the empty stomach and the sensation of hunger, A. J. CARLSON (*Amer. Jour. Physiol., 31 (1913), No. 4, pp. 175–192, figs. 6*).—In further experiments with a subject having a permanent fistula (E. S. R., 28, p. 567), a close correspondence was observed between the duration of the contractions of the empty stomach and of the sensation of hunger experienced simultaneously by the subject.

There was also a close relation between the strength of the contractions and the degree of the hunger sensation. Contractions produced artificially in a normal empty stomach were found to produce sensations of hunger. These

observations would indicate that the sensation of hunger is caused by contractions of the empty stomach.

Contributions to the physiology of the stomach.—III, The contractions of the empty stomach inhibited reflexly from the mouth, A. J. CARLSON (*Amer. Jour. Physiol., 31 (1913), No. 4, pp. 212–222, figs. 6*).—It was observed that the movements of mastication with the mouth empty produced no inhibition of the stomach contraction, and that the movements of swallowing gave only very slight inhibition.

Stimulation of the gustatory nerves of the mouth, however, by holding salt, sugar, acids, and alkalis in the mouth, by chewing an indifferent substance (e. g., paraffin), or by tasting or chewing palatable foods, produced inhibition of the stomach contractions directly proportional to the strength of the stimuli and inversely proportional to the degree of the stomach activity. It was further found that "the inhibition of the stomach activity and the cessation of the hunger pains run parallel." The author states that while the detailed mechanism of the inhibitions of the contractions of the empty stomach from the mouth remains to be worked out by further experiments, he believes them to be primary or fundamental reflexes and not dependent on the memory processes.

Concerning the resorption and retention of calcium and phosphorus by the intestine, F. ZUCKMAYER (*Pflüger's Arch. Physiol., 148 (1912), No. 4–5, pp. 225, 256, fig. 1*).—The author's investigations lead to the conclusion that colloidal potassium phosphates probably play a part in the resorption of the calcium supplied in the food.

The creatin content of muscle under normal conditions—its relation to the urinary creatinin, V. C. MYERS and M. S. FINE (*Jour. Biol. Chem., 14 (1913), No. 1, pp. 9–26*).—The percentage of creatin in the muscles of laboratory animals and a few specimens of human muscle was found to be not only constant for a given animal, but the figures appeared to be distinctive in each case.

The creatin elimination appeared to bear a constant relation to the percentage of muscle creatin. A constant relation was also found to exist between the daily elimination of creatinin and the total amount of creatin in the body, animals with a high daily elimination having a proportionately higher content of body creatin. The figures for urinary creatin followed the body weight in each case in the experiment. The authors believe that the constancy in the content of muscle creatin offers a satisfactory explanation of the constant daily elimination of creatinin which they and other workers have found.

A respiration apparatus, H. MURSCHHAUSER (*Biochem. Ztschr., 42 (1912), No. 4, pp. 262–280, pl. 1, figs. 2*).—A full description is given of an open air circuit apparatus for measuring the products of respiration of small animals.

The subject is placed in a small glass chamber which is kept at any desired temperature by being immersed in a water bath, the temperature of which is controlled by a thermostat. Provision is also made for the maintenance of the incoming air at any desired temperature and for the removal of carbon dioxid and water from it. Apparatus for complete analysis of the expired air forms a part of the apparatus.

Animal calorimetry.—I, A small respiration calorimeter, H. B. WILLIAMS (*Jour. Biol. Chem., 12 (1912), No. 3, pp. 317–347, pls. 3, figs. 4*).—This article describes a small respiration calorimeter of the same general type as that developed by Atwater and Rosa and designed especially for work with infants and small animals.

Special glass bottles are used for containing the sulphuric acid for the absorption of water vapor, and an automatic device for the admission of oxygen is employed. The temperature of the water entering the calorimeter is kept constant in two ways; it is fed to the heater at a constant temperature by first

passing through a coil immersed in a tank of water provided with a Gouy temperature regulator, and fluctuations in the heating current are prevented by means of a special "mercury-chloroform" regulator which is described fully. The author states that in "actual experimental work changes of more than 0.01–0.02° practically never occur except when it becomes necessary to change the temperature voluntarily."

Results and descriptions of control experiments proving the accuracy of the apparatus are also given.

Animal calorimetry.—II, Metabolism of the dog following the ingestion of meat in large quantity, H. B. WILLIAMS, J. A. RICHE, and G. LUSK (*Jour. Biol. Chem., 12 (1912), No. 3, pp. 349–376, tables 3*).—A dog which produced 22.3 calories during an hour previous to food ingestion was given 1,200 gm. of meat. The heat production rose to 36 calories in the second hour and to 42 in the third and was maintained above 40 calories per hour through the tenth hour. In the fourteenth hour it had fallen to 37 calories. It remained at 30 calories up to the eighteenth hour and fell rapidly to 25 calories in the twenty-first hour. The ingestion of 700 gm. of meat by the same dog caused an increase of metabolism which was less than that caused by 1,200 gm., but in proportion to the quantity ingested.

"The increased metabolism was proportional to the nitrogen elimination, except in the second and third hours. In the second hour the metabolism rose almost to its maximum although the urinary nitrogen reached only a third of its maximum. Since the nonprotein respiratory quotient for this period was often above 90, it appears that carbohydrate and not additional protein was oxidized during this hour. On this is based the argument that the incoming amino acids, in proportion to their mass action, stimulate the protoplasm to higher oxidation."

The calculated heat production did not always agree with that actually measured by the calorimeter during the second and third hours. This "is largely due to the fact that the rectal temperature of the dog does not give a measure of the temperature increase of the whole dog" since the skin temperature was found to rise higher than the rectal temperature after the ingestion of the food.

The authors conclude that the carbon derived from protein metabolism was retained in the organism as dextrose, since calculations based on this assumption showed that the actual quantity of oxygen absorbed agreed closely with that required, which would not have been the case if it had been stored as fat. The dextrose retained in relation to nitrogen eliminated was 1.2 : 1.

Intestinal work was believed to have little to do with the increased heat production, since a high metabolism was maintained after the work of the intestinal canal must have been largely completed.

Animal calorimetry.—III, Metabolism after the ingestion of dextrose and fat, including the behavior of water, urea, and sodium chlorid solutions, G. LUSK and J. A. RICHE (*Jour. Biol. Chem., 13 (1912), No. 1, pp. 27–47, fig. 1*).—The ingestion of from 50 to 100 gm. of dextrose gave rise to an increase of 20 per cent in the metabolism of energy of a dog during the first 4 or 5 hours after ingestion.

This increase was not believed to be due to the stimulation of the cells to greater action by the osmotic changes set up by the sugar entering the blood stream, since the ingestion of water and solutions of salt and urea, which were isotonic with the solutions of dextrose given, had no effect on the metabolism, but rather to the presence of an amount of readily oxidizable carbohydrate in the blood greater than is noted when there is no absorption of carbohydrate

from the intestine. The ingestion of olive oil, which, like dextrose, is readily absorbed, caused an increase of metabolism, probably for the same reason.

Animal calorimetry.—IV, Observations on the absorption of dextrose and the effect it has upon the composition of the blood, GERTRUDE FISHER and MARY B. WISHART (*Jour. Biol. Chem., 13 (1912), No. 1, pp. 49–61, fig. 1*).—A rapid absorption of the dextrose occurred during the first hour after ingestion and the sugar content of the blood rose above the normal.

At the end of the second hour about three-fourths of the ingested sugar was absorbed, little being retained as glycogen by the liver, and the sugar in the blood had returned to normal. This condition lasted through the third hour, and during the fourth hour the absorption was completed, the volume of the urine increased suddenly, and the increased metabolism ended.

Animal calorimetry.—V, The influence of the ingestion of amino acids upon metabolism, G. LUSK and J. A. RICHE (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 155–183, table 1*).—Results of experiments are given from which the authors conclude "that the increase in metabolism after the ingestion of meat is due to the mass action of amino acids acting as stimuli upon the cellular protoplasm." The observations upon which they base their conclusion are as follows:

The increase of heat production in dogs during the 2 or 3 hours following the ingestion of meat was much greater than could be derived from the protein metabolism shown to have taken place during that period.

Following the ingestion of glycocoll, the heat production rose to its maximum in the second hour when very little glycocoll had been destroyed. That the increased heat production was not due to the process of deaminization and urea production was shown by the fact that when glutamic acid, which is freely absorbed and deaminized, was ingested, no increase in heat production took place. It appeared from this that "the increase in metabolism during the second hour after giving glycocoll must be due to direct stimulus upon the cells." The action of alanin was similar to that of glycocoll but it was not so powerful a stimulant. Leucin and tyrosin also showed a slight stimulative action.

A mixture of 5.5 gm. each of glycocoll, alanin, glutamic acid, leucin, and tyrosin showed a more rapid metabolism of the constituents than when they were given alone. The effect on metabolism was as pronounced as that produced by 25 gm. of glycocoll and greater than that of 100 gm. of meat containing the same quantity of nitrogen.

The influence of glycocoll and alanin is not due to the fact that they produce nausea or to movements of the intestines, since urea solutions, which produce nausea, and saline cathartics do not influence metabolism.

Glycocoll and alanin do not act like sugar, into which they are both completely convertible. Instead of acting through the metabolism products which they form, which have practically no effect on the heat production, they act as stimuli on the protoplasm with which they come in contact.

Animal calorimetry.—VI. The influence of mixtures of foodstuffs upon metabolism, G. LUSK and J. A. RICHE (*Jour. Biol. Chem., 13 (1912), No. 2, pp. 185–207, tables 2*).—On a standard diet of 100 gm. of meat, 100 gm. of biscuit meal, and 20 gm. of lard, upon which a dog was maintained for 6 months, the average hourly heat production was 23.3 calories during the first 4 hours after ingestion. On reducing the meat to 33 gm. the heat production fell to 22.8 calories, while on replacing 67 gm. of the meat with 20 gm. of glutamic acid it fell to 22.7 calories per hour.

On a diet of 50 gm. of biscuit meal the heat production was 19.1 calories per hour, which was unchanged by the addition of 10 gm. of lard. The further

addition of 33 gm. of meat to this mixture was followed by a metabolism of 20.6 calories per hour. As 100 gm. of meat alone was found to give an apparent metabolism of 20.2 calories per hour, it appeared possible that the amino acids in the meat and biscuit meal might determine the height of metabolism when the above diet was given.

When the mixture of 50 gm. of biscuit meal, 33 gm. of meat, and 10 gm. of lard was given with 20 gm. of glutamic acid and with 20 gm. of alanin, the heat production remained unchanged at 20.1 calories per hour. Although 20 gm. of alanin given alone was found to increase the metabolism from 16.2 calories to 19.2 calories per hour, it was without effect when given with a diet which, of itself, produced a higher metabolism. When the above mixed diet was given with 20 gm. of glycocoll, the metabolism rose to 22.8 calories per hour, the same level found to be produced by 25 gm. of glycocoll when given alone. "It appears, therefore, that in this case the metabolism rose to the height which glycocoll alone would have induced."

The authors believe that these results give a more exact conception of metabolism. A large oxidation of fat and carbohydrate is believed to take place when these substances are furnished to the cells in larger amounts during the absorption of food, but a moderate addition of fat to the diet may not increase a metabolism which is already raised to a higher level by the ingestion of carbohydrate. "Addition of meat or of amino acids to a mixed diet does not increase the metabolism of fat and carbohydrate unless the stimulus of the amino acids would alone effect this result.

"One may conclude that there are the following forms of metabolism in the quiet or sleeping dog excluded from thermal influences: (1) A basal metabolism when the cells are nourished by a blood stream which does not receive food from the intestinal tract but the composition of which is regulated by the organs of the body; (2) a metabolism due to plethora, induced by an increased quantity of carbohydrate of fat metabolites in the blood on account of absorption from the intestine; and (3) a metabolism due to the stimulus of amino acids." The last two can not be added and no summation of effect occurs when the two influences act simultaneously. "In other words, the level of cellular oxidation induced by plethora is not further heightened by the stimulus of amino acids, unless the latter alone would accomplish such increase in activity."

Metabolism of scurvy in an adult, L. BAUMANN and C. P. HOWARD (*Trans. Assoc. Amer. Physicians, 27 (1912), pp. 514–533, fig. 1*).—In this case, the addition of orange juice to the diet of the patient was followed by an increase in the amount of nitrogen and mineral constituents retained in the body, as shown by metabolism experiments.

New experiments on the importance of training in the production of muscular work, H. PEDER (*Skand. Arch. Physiol., 27 (1912), No. 4–6, pp. 314–340, figs. 8*).—From experimental data recorded, the conclusion is reached that the ability to perform muscular work can be materially increased in a short time by constant training, that the muscular power decreases markedly when training is discontinued, that performing severe work will keep muscular efficiency at a high level for a long time, and that training causes marked increase in endurance.

ANIMAL PRODUCTION.

Cold-storage business features, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 93, pp. 86, figs. 3*).—A statistical study of the business features of cold storage, a preliminary account of which has been previously noted (E. S. R., 27, p. 164).

The information was obtained from statements of warehousemen regarding receipts of fresh beef, mutton, pork, dressed poultry, butter, and eggs for each month during a period of 2 years. The records began in March, 1909, for dressed poultry and eggs, and in May, 1909, for the other commodities, and included schedules for statements of the deliveries for each month out of storage to the end of August, 1911. There were also schedules for the storage of freshly frozen fish, but as they were incomplete no statistical study was made of them.

The relative monthly receipts are shown in the following table:

Relative monthly receipts of fresh beef, mutton, pork, butter, dressed poultry, and eggs.

Month of receipts	Beef, fresh.		Mutton, fresh.		Pork, fresh.		Butter.		Poultry, dressed.		Eggs.	
	1909–10	1910–11	1909–10	1910–11	1909–10	1910–11	1909–10	1910–11	1909–10	1910–11	1909–10	1910–11
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
March	.....	.....	.....	.....	.....	.....	.....	.....	6.9	2.9	4.7	6.7
April	.....	.....	.....	.....	.....	.....	.....	.....	2.4	2.0	32.9	41.9
May	4.7	7.3	2.9	0.8	7.6	7.6	3.6	10.0	2.8	1.0	34.3	25.0
June	6.1	7.3	4.0	6.3	8.9	9.0	28.6	31.9	2.4	.9	18.4	12.5
July	6.7	9.8	7.6	7.1	8.0	7.6	29.5	26.7	2.0	1.5	3.9	6.4
August	5.1	7.6	13.3	21.3	7.1	7.3	14.9	11.4	2.2	14.0	2.0	1.4
September	11.9	19.3	25.2	21.4	7.1	6.9	5.9	7.5	3.8	3.7	1.6	2.5
October	25.6	17.5	26.0	17.1	7.2	6.7	4.8	4.0	11.1	7.7	.9	1.1
November	12.1	10.2	8.6	9.4	8.7	8.3	2.1	2.4	18.9	20.9	.3	1.1
December	6.7	6.0	2.8	4.9	9.7	8.7	1.2	1.3	22.5	28.0	.5	.6
January	4.0	4.7	1.6	2.3	10.2	10.2	4.2	2.1	17.6	10.3	.2	.4
February	6.1	3.5	1.9	2.1	9.2	10.3	3.1	.6	7.4	7.1	.3	.4
March	6.9	3.7	4.8	4.7	9.3	8.8	.9	1.3	.....	.....	.....	.....
April	4.1	3.1	1.3	2.6	7.0	8.6	1.2	.8	.....	.....	.....	.....
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

It is established by this investigation that 71.2 per cent of the fresh beef received into cold storage in the year 1909–10 was delivered within 3 months, 28.8 per cent of the fresh mutton, 95.2 per cent of the fresh pork, 75.7 per cent of the dressed poultry, 40.2 per cent of the butter, and 14.3 per cent of the eggs. Within 4 months after it was received, 86 per cent of the fresh beef was delivered, 42.7 per cent of the fresh mutton, 96.5 per cent of the fresh pork, 85.3 per cent of the dressed poultry, 53.4 per cent of the butter, and 22.6 per cent of the eggs. The percentage of receipts delivered in 7 months is 99 for fresh beef, 99.3 per cent for fresh mutton, 99.9 per cent for fresh pork, 96.1 per cent for dressed poultry, 88.4 per cent for butter, and 75.8 per cent for eggs. Those in 10 months are 99.7 per cent for fresh beef, 99.5 per cent for fresh mutton, 99.9 per cent for fresh pork, 98.9 per cent for dressed poultry, 97.8 per cent for butter, and 99.9 per cent for eggs.

For the following year, 1910–11, the deliveries of 3 and 4 months were mostly considerably below those quoted for 1909–10. Comparisons could not be made for the longer periods.

The important observation to be made is that the receipts into cold storage are entirely or very nearly exhausted by the deliveries within 10 months. Very small percentages of some of the commodities were stored for a much longer time, but these are explained by warehouse men as being caused by special circumstances of an uncommercial nature.

"From the natural storage year ending August, 1910, 9.6 per cent of the receipts was carried over to the next year in the case of fresh beef; the percentage for fresh mutton for the natural storage year ending July, 1910, was

15.1 per cent; for fresh pork for the natural storage year ending April, 1910, 5.4 per cent; for dressed poultry for the natural storage year ending July, 1910, 7.7 per cent; for butter for the natural storage year ending April, 1910, 4.9 per cent, and for eggs for the natural storage year ending April, 1910, 0.2 of 1 per cent.

"Between the two years covered by the schedules, 1909–10 and 1910–11, there are considerable differences in the percentages of the receipts carried over to the next year. The two years were not similar ones with respect either to production or the business handling of cold-storage commodities.

"From the schedule year ending with April the percentage of receipts of fresh beef for 1909–10 carried over to the next year was 5.5; for the year 1910–11 it was 12.7 per cent. For fresh mutton . . . the percentage was 7.2 for the year 1909–10 and 19 for 1910–11, [and] for fresh pork 5.4 for 1909–10 and 12.6 for 1910–11.

"The largest carry-over found among the six commodities was that of dressed poultry. For the schedule year ending February, 1910, 29.3 per cent of the receipts was carried over, and from 1910–11, 26.9 per cent. The butter carry-over for the year ending with April was 4.9 per cent for 1909–10 and 12.5 per cent for 1910–11. Decidedly the lowest carry-over is that of eggs, the percentage for the year ending February, 1910, being only 0.2 of 1, and for the year 1910–11, 0.5 of 1 per cent. . . .

"The fresh beef received into storage during the year beginning May, 1909, was kept there on the average for 2.28 months; the fresh mutton, 4.45 months; the fresh pork, 0.88 of 1 month, and the butter, 4.43 months. The poultry received during the year beginning March, 1909, was kept on the average 2.42 months; the eggs, 5.91 months. . . .

The costs for space, interest, and insurance, combined "amount to 0.437 ct. per pound of fresh beef per month, or 3.5 per cent of the mean wholesale price of beef from September to November, 1910, the latest period of heavy warehouse receipts within the period covered by this investigation; for fresh mutton the costs are 0.352 ct. per pound, or 3.8 per cent of the mean wholesale price in the heavy storage months, August to October, 1910; for fresh pork, 0.397 ct. per pound, or 3.7 per cent of the mean wholesale price of January and February, 1911; for dressed poultry, 0.446 ct. per pound, or 2.8 per cent of the mean wholesale price of the largest class of poultry during October, 1910, to January, 1911; for butter, 0.571 ct. per pound, or 2.4 per cent of the mean wholesale price of butter during June to August, 1911; and for eggs, the costs amount to 0.593 ct. per dozen, or 3 per cent of the mean wholesale price of eggs, April to June, 1910. . . .

"For the average length of time in cold storage as ascertained in this investigation the actual costs are for fresh beef, 0.997 ct. per pound; fresh mutton, 1.564 cts. per pound; fresh pork, 0.350 ct. per pound; for poultry, 1.079 cts. per pound; for butter, 2.532 cts. per pound; for eggs, 3.505 cts. a dozen."

These costs "are 7.9 per cent of the wholesale price for fresh beef, 17.1 per cent for fresh mutton, 3.2 per cent for fresh pork, 6.8 per cent for poultry, 10.8 per cent for butter, and 18 per cent for eggs. . . .

"The estimated receipts into cold storage during one year, the mean of 1909–10 and 1910–11 being adopted, amounted in round numbers to 131,000,000 lbs. of fresh beef, 20,000,000 lbs. of fresh mutton, 176,000,000 lbs. of fresh pork, 157,000,000 lbs. of butter, and 10,000,000 cases of eggs. . . . It appears that 3.1 per cent of a year's production of fresh beef, commercial slaughter, goes into cold storage; 4.1 per cent of the commercial slaughter of mutton; and 11.5 per cent of the commercial slaughter of pork. Of the farm and factory production of butter during a year, 9.6 per cent goes into cold storage, and

of the farm and nonfarm production of eggs, 15 per cent. . . . The wholesale value of the fresh beef received into cold storage, to use a round number, is $15,000,000; of the fresh mutton, $1,600,000; of the fresh pork, $18,000,000; of the butter, $40,000,000; and of the eggs, $64,000,000."

Supplementary to this study the monthly receipts of butter and eggs of several of the larger markets of the country are given for each month from 1880–1911. The conclusion is drawn that the production was related directly to marketings and inversely to prices. This relation is more marked with eggs than with butter, because the latter can be kept longer without deterioration.

Cold storage and prices, G. K. Holmes (*U. S. Dept. Agr., Bur. Statis. Bul. 101, pp. 116, figs. 7*).—This is a statistical study of prices of commodities in the report noted above and supplementary to that work. There is in addition a special compilation of prices of butter and eggs in New York City.

The purpose of the work was to observe fluctuations of prices before cold storage was of considerable account, in order to compare them with fluctuations in recent years during which the business has grown to large proportions. Therefore, the wholesale prices of commodities were taken for as many markets as possible throughout the United States as far back as 1880. The cold storage period beginning in 1893 and ending in the compilation of prices in 1911 was subdivided into 2 periods at 1902, for the purpose of making a group of the more recent cold storage years. The 3 periods are referred to as first, second, and third. The first period covers 13 years, and the second and third 9 years each. During this period of 31 years grades have changed, and also the quoted grades. The error due to this fact was avoided by taking prices for grades that remained uniform from October to October of the next year.

"The mean price of fresh beef in the 2 cities for which the record was made was 8.6 cts. per pound in the first period and 10.3 cts. in the third; the price of mutton in 3 cities increased from 7.9 cts. in the first period to 8.1 cts. in the third period; pork in 2 cities from 7.1 cts. in the first period to 8.6 cts. in the third. The increase for butter in 13 cities was from 23.9 cts. to 24.3 cts.; and the increase for eggs in 12 cities was from 17.3 cts. to 21.2 cts."

The price levels were determined by weighting the price numbers with the relative monthly consumption expressed in cents per pound. It was found that the price level of all the commodities studied was considerably higher in the third period than in the first, except in the case of butter in New York City. There was also an almost invariable tendency toward a higher price level when prices are treated as index numbers.

Some of the results obtained from a study of the uniformity of prices throughout the year are stated as follows: "If the prices index numbers of the first period, which stand for fresh butter, are compared with those for cold-storage butter in the third period, it is evident that for every one of the 12 months there was a tendency toward uniformity of prices.

"The evidence for eggs is similar, but not so strong. A comparison of the first and third periods for fresh eggs finds a tendency toward uniformity of prices in 8 months and away from uniformity in 4 months; and, if the fresh eggs of the first period be compared with cold-storage eggs of the third period, there is a tendency toward uniformity of prices for 10 months and away from uniformity in 2 months. . . . For beef there was a tendency toward uniformity of prices for only 3 of the 13 months; for mutton, for 9 of the 13 months; for pork, for only 5 of the 13 months; for poultry, for 8 of the 13 months; for butter, for 11 of the 13 months; and for eggs, for 9 of the 13 months. The general fact may be regarded as established that there was a

general tendency toward uniformity of prices for 4 of the commodities, and that there was a contrary tendency for fresh beef and fresh pork. . . . The range of prices index numbers for fresh eggs in New York in the first period was 61.5, and in the second period 58.3, while the range for cold-storage eggs in the third period was only 27.1. It is therefore apparent that the contention of the cold-storage interests that cold storage has counted for uniformity of prices is largely true, but it is not true for all commodities, nor for all comparisons of years and periods."

The course of prices at the farm from October, 1909, to September, 1911, of butter, eggs, live chickens, beef cattle, sheep, lambs, and hogs showed that the farm prices varied with city prices, although sometimes the farm price followed the city price, and sometimes the reverse.

The export movement did not seem to be closely related to the cold storage of butter and eggs.

Other conclusions drawn are the following: "An actual movement of prices to higher or lower level is an accomplished fact, and cold storage may or may not play a large part as a cause of the movement. Price is the product of many factors and cold storage is only one of them. With regard to tendency toward equalization of prices as a result of cold storage, the discrepancy between theoretical expectation and actual fulfillment needs explanation."

"Let the fact be what it will with regard to the effect of cold storage on prices, the fact remains that cold storage has been of incalculable benefit to consumers in providing commodities for consumptiton out of the natural productive season. This service costs an immense amount of money every year."

An appendix contains the wholesale prices of the specified markets from 1880–1911, which are presented in tabular form.

[Experiments in animal husbandry] (*Wisconsin Sta. Bul. 228, pp. 33–42. figs. 3*).—A brief report of work, some of which has been previously noted from other sources. Earlier work in feeding rations from restricted sources (E. S. R., 26, p. 467) has been continued by E. B. Hart. Wheat straw as the sole roughage for cows resulted in the birth of weak calves. This occurred no matter what grain rations were fed. The cause of this is thought to be the acid condition caused by an insufficient supply of lime and other alkaline substances in the wheat straw.

Continuing work on the fundamental problems in animal nutrition with small mammals, E. V. McCollum found that normal growth could not be produced with young rats on any natural grain, but that it could be secured by a ration of skim milk powder and on egg yolk. The rats also grew normally for from 75 to 100 days on a ration of pure casein and dextrin if salt mixtures were supplied making the mineral content of the ration similar to that of either milk or egg yolk. When the same casein and dextrin mixtures were fed with a salt mixture having a mineral content similar to that of wheat grain the growth was completely suspended.

To study the effect of sulphur in feeds upon wool production, a ration of hay, grain, and sugar beets, having a low sulphur content, was fed against hay, grain, and ruta-bagas, with a high sulphur content. The same basal ration was also given with calcium sulphate as a source of inorganic sulphur. It was found that neither the average gross weight of the fleeces nor the proportion of pure wool fiber to the total weight was greater on the high-sulphur than on the low-sulphur rations. The percentage of sulphur in the pure fiber of the various lots was practically the same, as was the yolk in the fleeces.

In a study of retention of nitrogen in pigs when given different amounts of protein, E. V. McCollom found that when the nutritive ratio was 1:11, 10 per cent of the nitrogen was retained, and when the nutritive ratio was 1:5.5 and

under, 23 per cent of nitrogen was retained. In experiments with heifers amid nitrogen in alfalfa was found to be equal in value to other forms of nitrogen.

In a test of roughage for steers, conducted by J. L. Tormey, the most economical and the largest gains were made with silage as a roughage, the average daily gain for 104 days being 2.73 lbs. per steer. Silage and alfalfa hay gave better results than alfalfa hay alone. The grain ration used consisted of corn meal, bran, and cotton-seed meal.

G. C. Humphrey undertook an experiment in making silage of beet tops and shocked corn. The silage had a stronger odor, but its chemical composition was the same as corn silage and equally as good results were obtained when it was fed to dairy cows.

Napier's fodder (Pennisetum benthami), H. G. MUNDY (*Rhodesia Agr. Jour., 9 (1911), No. 2, pp. 227–229*).—The composition of Napier's fodder (E. S. R., 24, p. 337), known also by the native name of Zinyamunga or Marambamunga, was as follows: Water 61.81 per cent; ether extract 0.29 per cent; protein 2.92 per cent; carbohydrate 17.29 per cent; fiber 14.77 per cent; and ash 2.92 per cent. The composition of sugar-cane fodder, grown under similar conditions, was as follows: Water 73.63 per cent; ether extract 0.22 per cent; protein 1.27 per cent; carbohydrate 17.73 per cent; fiber 5.32 per cent; and ash 1.83 per cent.

Lupine flakes, R. NEUMANN and A. LÖSCHE (*Landw. Vers. Stat., 78 (1912), No. 3–4, pp. 253–264*).—Lupines from which the bitter principle had been extracted were mixed with potatoes and then steamed and dried in the form of flakes. The analysis of the water-free material was as follows: Protein 30.8 per cent; fat 2.69 per cent; nitrogen-free extract 49.4 per cent; fiber 12.94 per cent, and ash 4.17 per cent. In experiments with wethers the following digestion coefficients were obtained: Protein 86.28 per cent; fat 73.66 per cent; nitrogen-free extract 94.33 per cent; and fiber 90.56 per cent.

Contribution to the study of sesame-oil cake, A. GRÉGOIRE and E. CARPIAUX (*Bul. Soc. Chim. Belg., 26 (1912), No. 11, pp. 479–485; abs. in Jour. Soc. Chem. Indus., 32 (1913), No. 1, p. 32*).—Samples of linseed-oil cake were found, on a microscopical examination, to contain sesame-oil cake. The probable amount of adulteration was determined by the relative amount of oxalic acid and calcium oxid in the two kinds of cake.

The pasture for Pinzgau-Möllthal bull calves at Hintereggen in Carinthia and its economical results, J. H. DORTA (*Bol. Assoc. Agr. Friulana, 7. ser., 29 (1912); abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2696, 2697*).—The average gains of 18 head of cattle on mountain pasture for 127 days are given as follows: Weight 292 lbs., height at withers 3.32 in., girth 7.85 in., depth of chest 2.13 in., breadth of chest 2.55 in., width of hips 1.48 in., length of body 4.23 in., and circumference of shin 0.6 in.

The application of biometrics to studies of cattle, with special reference to the Glatzer Mountain cattle, W. ZORN (*Mitt. Landw. Inst. Breslau, 6 (1912), No. 4, pp. 449–502, pls. 5*).—Measurements of 120 cows in the region of the Glatzer Mountains are given, and used as an illustration of the application of biometrical methods in morphological studies of cattle.

Cattle breeding in Württemberg, P. MÜLLER (*Tübinger Staatswiss. Abhandl., 1911, No. 20, pp. X+335*).—A general account of the history and present condition of the cattle industry in Württemberg. It contains statistics on the cattle trade, a discussion of the origin and distribution of different types of cattle, methods of breeding and feeding for the production of milk and beef, measures for the improvement of the cattle industry and an account of breeders' associations.

Possibilities for a new breed of cattle for the South, R. K. NABOURS (*Amer. Breeders Mag., 4 (1913), No. 1, pp. 38–52, figs. 8*).—A discussion of the results thus far obtained from the introduction of zebus into Texas.

On the amount, specific gravity, and phenol content of the urine of sheep on different rations, A. MEYER (*Über Menge, specifisches Gewicht, und Phenolgehalt des Schafharns bei verschiedener Ernahrung. Inaug. Diss., Univ. Leipsic, 1911, pp. 67*).—A report of original investigations on the excretion of phenol, and a summary of previous work by other investigators.

The amount of urine excreted and the amount of phenol in the urine were dependent largely upon the nature of the feed, the amount being much larger on a ration of green feed containing large amounts of water than on a diet of hay and straw. The amount was extraordinarily large on a milk diet. The specific gravity varied according to the amount of urine, being lowest when the amount of urine was large. The phenol was found in all parts of the alimentary tract. Constipating drugs increased and purgatives decreased the excretion of paracresol in the urine.

The wool industry in the British dominions, C. E. W. BEAN (*Jour. Roy. Soc. Arts, 61 (1913), No. 3143, pp. 327–347*).—A general and historical account of the sheep industry in Great Britain, Australia, and other British colonies.

The goat in the Pyrenees, F. GIRARD (*Vie Agr. et Rurale, 1 (1912), No. 18, pp. 479–484; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2713–2716*).—The characteristics and other information concerning the Pyrenean goat are discussed.

Bacon for export, E. J. SHELTON (*Agr. Gaz. N. S. Wales, 24 (1913), No. 1, pp. 42–48*).—A report of a study of the bacon industry in Richmond River district of New South Wales is given. The principal topics discussed are the type of bacon pig, methods of feeding, slaughtering, and curing bacon.

Horses and horse breeding, H. K. BUSH-BROWN (*Amer. Breeders Mag., 3 (1912), No. 4, pp. 282–289, figs. 5*).—An outline of a method for measuring horses as a guide to judging, in which it is proposed that the height of the horse at the withers be divided into 3 equal parts or heads, each head into 4 parts called quarters, and each quarter into 6 parts called minims. This division is for the purpose of facilitating closer measurement by setting down the actual proportional measurements on this scale so that a record of the exact form and structural peculiarities of the animal may be obtained and made available for comparison with other individuals. The measurements of several noted stallions are given.

Color factors in the hair of the horse, J. M. EGLOFF (*Amer. Breeders Mag., 4 (1913), No. 1, pp. 27–31*).—From a study of the pigment granules in the hair of horses of different color the author concludes that there is one color of pigment running through all colors of hair, there being an increase in the number of pigment granules from the lighter to the darker colors but no apparent difference in the size of the granules. He finds no apparent correlation between the size of the medullary layer and the color of the hair, with the possible exception of the grays. There was a very marked difference in the distribution of the pigment granules. From the standpoint of inheritance he finds 6 factors that may influence color, namely, pigment, oxidizing, clustering, distribution, quantitative, and pattern factors.

The measurements of 1,460 stud horses and of 590 army horses, S. VON NATHUSIUS (*Arb. Deut. Landw. Gesell., 1912, No. 205, pp. 247; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 7, pp. 1594, 1595*).—Measurements are reported of horses at different ages, and in a discussion of results the author replies to criticisms made to measurements which he had previously reported. The types of horses measured include the

English Thoroughbred, trotters, Hanoverian, Holstein Marsh, original Belgian, Rhenish Belgian, and German Belgian.

The present condition of horse breeding in Hungary, J. PODMANICZKY (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2551–2561*).—An account of the national studs and the general condition of horse breeding in Hungary.

The mechanistic conception of life, J. LOEB (*Chicago and London, 1912. pp. VI+232, figs. 58; rev. in Nature [London], 90 (1912), No. 2247, pp. 327–328; Science, n. ser., 37 (1913), No. 948, pp. 333–336*).—This book consists of a number of essays, written at different times, on the nature of the process of fertilization, effect of environment on the animal, and related topics. Some of them have been previously noted from other sources, and for the most part they consist of facts derived from the author's own experimental work.

The theory of the determination of sex, C. EMERY (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1912), II, No. 7, pp. 397–400; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 12, pp. 2681–2683*).—A critical review of the chromosome theories of sex. The author believes that the determinant of the male is always present in the ova and spermatozoa, and is ready to act when the female determinant is insufficient.

Studies in the blood relationship of animals as displayed in the composition of the serum proteins, T. B. ROBERTSON (*Jour. Biol. Chem., 13 (1912), No. 3, pp. 325–340*).—Methods are described for a comparison of the sera of the horse, rabbit, rat, and ox with respect to their content of various proteins in the normal and in the fasting condition. The following conclusions were reached:

"The refractometric method of analysis yields results (with the rabbit) which closely agree with those obtained by previous observers, employing other methods of analysis. Horse serum does not contain preformed crystallizable albumin to the extent of more than 40 per cent of the total albumins. The refractometric method can not be employed to determine more precisely than this quantity of crystallizable albumins contained in sera.

"Provided not over 40 per cent of the albumins are of the crystallizable variety, no appreciable error is introduced into the refractometric determinations of the total albumins and total proteins in sera by assuming that all of the albumins present have the refractivity of amorphous serum albumin, to wit, 0.00177 per gram per 100 cc. of solvent.

"The relative proportion in which the above mentioned three groups of proteins are present in the serum of fully fed animals is subject to rather high individual variations; the average values are, however, characteristic of the species from which the serum is derived. The percentage of total proteins in sera derived from different fasting individuals (with free access to water) is highly variable. The relative proportions . . . in the sera of fasting animals of the same species (rabbits) is constant within the limits of the experimental error of the determination. During starvation, the total protein content of the blood serum rises.

"In the rabbit, ox, and horse starvation leads to an increase in the proportion of albumins to globulins in the serum, while in the rat and in the dog starvation leads to an increase in the proportion of globulins to albumins."

Investigations on the morphology and function of the epithelium of the uterine cornua of mammals, R. MOREAUX (*Arch. Anat. Micros., 14 (1913), No. 4, pp. 515–576, pls. 2*).—A microscopical study is reported of the cell structure and secretions of the epithelium of the uterine cornua in rabbits at different stages of the oestrous cycle and during pregnancy. There is a review of

previous work on the subject by other investigators on other animals, and a bibliography is appended.

On the nonenzymatic character of oöcytin (oöcytase), T. B. ROBERTSON (*Jour Biol. Chem., 12 (1912), No. 2, pp. 163–173*).—The active agent in ox serum, which is concerned in the formation of fertilizing membrane and was formerly called oöcytase (E. S. R., 26, p. 877), is now found not to be an enzym.

Lipoid metabolism in the developing chick, and its relation to calcification, F. M. HANES (*Jour. Expt. Med., 16 (1912), No. 4, pp. 512–526, pls. 2*).—A study of the chemical changes taking place in the liver of the developing chick. The results are summarized as follows:

"The liver of the embryo chick during the first 2 weeks of development contains an abundance of isotropic fatty globules which represent a mixture of lipoids in which phosphorized fats predominate. During the third week of incubation the fatty globules in the liver change their physical and chemical characters. They become anisotropic and exhibit the reactions and properties of esters of cholesterol. The phosphorized fats gradually disappear from the liver during the third week.

"The phosphoric acid utilized by the embryo chick in calcification is derived from phosphorized fats. It is suggested that the phosphorized fats are split in the liver, the glycerophosphoric acid portion being liberated for calcification, while the free fatty acids are esterfied by cholesterol.

"A review of chemical analyses of aortic atherosclerosis and calcification made by others, and a comparison of the conditions in atherosclerosis with those of the developing chick liver, suggest that pathological calcification results from a splitting in situ of phosphorized fats with subsequent formation of calcium salts, as suggested by Baldauf."

Outlines of evolutionary biology, A. DENDY (*New York, 1912, pp. XIV+454, figs. 188*).—A general treatise on variation, heredity, and evolution of species in nature and under domestication.

Theories in evolution, Y. DELAGE and MARIE GOLDSMITH, trans. by A. TRIDON (*New York, 1913, pp. 352*).—A critical examination of current theories of heredity and of the origin, differentiation, and transmutation of species from the standpoint of a biologist who believes that acquired characters are transmissible.

Genetics, H. E. WALTER (*New York, 1913, pp. XIV+272, pl. 1, figs. 71*).—A brief and semipopular presentation of the more important problems of heredity. The book is intended for the general reader and for use in college courses in heredity and evolution.

The trend of the problem of development and inheritance, A. GREIL (*Richtlinien des Entwicklungs- und Vererbungsproblems. Jena, 1912, vols. 1, pp. 352; 2, pp. 364; rev. in Science, n. ser., 37 (1913), No. 947, pp. 304, 305*).—A discussion of the factors concerned in heredity and evolution from the standpoint of the epigenesist. The first part is a reprint of a work previously noted (E. S. R., 27, p. 175).

The new laws of heredity, C. CORRENS (*Die Neuen Vererbungsgesetze. Berlin, 1912, pp. VIII+75, pl. 1, figs. 11*).—This is a résumé of the results of recent investigations on inheritance in plants, animals, and man.

On gametic series involving reduplication of certain terms, W. BATESON and R. C. PUNNETT (*Jour. Genetics, 1 (1911), No. 4, pp. 293–302, pl. 1, figs. 4*).—Examples of different types of reduplication, previously called "coupling" and "repulsion" (E. S. R., 25, p. 672), are given.

Forms of reduplication—Primary and secondary, A. H. TROW (*Jour. Genetics, 2 (1913), No. 4, pp. 313–324*).—An analysis of systems of segregation, in which new forms of reduplication are demonstrated.

Proof of the inheritance of acquired characters by the Roentgen rays, M. FRAENKEL (*Arch. Mikros. Anat., 80 (1912), No. 2, II, pp. 61–77, pl. 1; Umschau, 16 (1912), No. 52, pp. 1094, 1095, figs. 3*).—Subjecting ovaries of young guinea pigs to the action of Roentgen rays caused changes in the ovary and in the germ cells. The weak and stunted characters in the young of the treated animals were transmitted to subsequent generations, thus demonstrating that a change in germ plasm caused by an abnormal environment could be inherited.

Hybridization studies.—VII, The hybrids of Phasianus and Gallus, H. POLL (*Sitzber. K. Preuss. Akad. Wiss., 1912, II, pp. 864–883, pls. 2, figs. 4*).—A continuation of earlier work (E. S. R., 27, p. 371). The present article consists mainly of a summary of literature on hybrids between Phasianus and Gallus, with special reference to external characters and the condition of the sex organs.

The determination of secondary sexual characters in Gallinaceæ, A. PÉZARD (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 18, pp. 1183–1186*).—This is a continuation of earlier work (E. S. R., 26, p. 774).

DAIRY FARMING—DAIRYING.

A study of feeding standards for milk production, E. S. SAVAGE (*New York Cornell Sta. Bul. 323, pp. 59–123*).—A discussion of a number of feeding standards, particularly those of Haecker and Armsby, and a report of experiments in feeding dairy cows during the winters of 1909–10 and 1910–11, planned for the purpose of applying the Haecker standard in the feeding of dairy cows.

During the first winter 12 cows were divided into 3 groups and fed rations of corn silage, mangels, distillers' dried grains, hominy chop, old process linseed meal, wheat bran, and mixed hay containing about ½ clover. The rations were so balanced that the nutritive ratio would lie between 1:6 and 1:7, except that during one period one group was fed a ratio of 1:6. In the following year a similar lot of cows was fed a ration of clover hay, corn silage, mangels, and grain mixtures consisting of hominy chop, wheat bran, gluten feed, and distillers' dried grains. The rations for this year were so constructed that the nutritive ratio would be about 1:7, except that for a portion of the time for 2 groups the rations averaged 1:6.3 and 1:6.2, respectively. Analyses of feeds are given and data of nutrients fed and the milk production of each cow during the experimental periods are presented in tabular form.

On the whole, the narrow ration apparently increased slightly the total amount of milk fat produced and at less cost. It is thought that an increase of at least 10 per cent in the amount of total nutrients above that allowed by Haecker would stimulate a better production, to an extent great enough to pay for the increased feed.

"An allowance of at least 0.06 lb. of protein for 1 lb. of 4 per cent milk will probably lead to a greater production of butter fat than will 0.05 lb. of protein if only 0.5 lb. of protein is allowed daily for the maintenance of a 1,000-lb. animal. While 0.3 therm energy seems to be sufficient for 1 lb. of 4 per cent milk, more than that must be allowed for better grades of milk. While the production values suggested by Armsby from his own and Kellner's work are probably nearer the true relative values of different feeding stuffs, it does not seem to the writer that they represent enough difference in practice to recommend a change to this system at present, particularly in teaching a feeding standard for milk. . . .

"In New York State, where the prices of such protein foods as gluten feed and distillers' dried grains are relatively no higher than many carbohydrate foods, the question of the cost of protein is not so important as in States farther

west. Therefore, rations with nutritive ratios not wider than 1:6 are recommended in New York and in the Eastern States in general."

A standard is proposed which is a modification of that of Haecker, in which the amounts of nutriment and protein for maintenance have remained about the same, but the protein for product has been increased by about 35 per cent. This amount was added in order that the cow weighing 1,000 lbs. and giving about 30 lbs. of milk testing either 3, 4, or 5 per cent fat, shall have a ration with a nutritive ratio of approximately 1:6.

Researches on the conformation of the cow in relation to milk production, E. REGGIANI (*Mod. Zooiatro, Parte Sci., 1912, Nos. 10, pp. 433–453; 11, pp. 465–477; 12, pp. 517–529, fig. 1*).—Measurements are reported of 158 cows, with a discussion of the correlation of conformation and milk production.

Inheritance of milk production and its significance to cow-testing associations, J. PETERS (*Deut. Landw. Tierzucht, 17 (1913), Nos. 11, pp. 121–125; 12, pp. 133–135; 13, pp. 145–149*).—From the data presented on milk records of cows of known ancestry, it is apparent that a knowledge of the pedigree of the breeding stock is of as much, if not of more, importance than a knowledge of the milking qualities of the dam.

Experiment with the dairy herd (*New Mexico Sta. Rpt. 1912, pp. 24, 25*).—A brief report is given of the results obtained during the third year of an experiment having for its object the ascertaining of the economy of feeding grain to dairy cows when on good pasture.

Cows at pasture with no grain gave 9,345 lbs. of milk containing 384 lbs. of milk fat, at a cost of 42 cts. per hundredweight of milk and 11 cts. per pound for milk fat. Cows fed a medium heavy grain ration gave 9,955 lbs. of milk containing 417 lbs. of milk fat, at a cost of 84 cts. per hundredweight for milk and 19¾ cts. per pound for milk fat.

Report of the Austrian dairy commission (*Österr. Molk. Ztg., 19 (1912), Nos. 12, pp. 172, 180; 14, pp. 211, 212*).—A continuation of earlier work (E. S. R., 27, p. 375), containing statistical data and miscellaneous information on dairying in the Tyrol.

Dairying in Australasia, M. A. O'CALLAGHAN (*Sydney, N. S. Wales, 1912, pp. LXII+741, pls. 119, figs. 3*).—This is a handbook for dairy farmers, creamery managers, butter makers, and students of dairying. All phases of the subject are treated from milk production to the utilization of the by-products of the dairy farm or creamery.

Dairy technology, C. LARSEN and W. WHITE (*New York, 1913, pp. XIII+298, figs. 48*).—This book treats of the properties of milk, its food value, the city milk supply, ice cream making, mechanical refrigeration, cottage cheese, buttermilk cheese, whey butter, milk sugar, fermented milk, condensed milk, powdered milk, renovated butter, and oleomargarine.

The influence of the treatment of milk upon its coagulating ability, W. MÜLLER (*Biochem. Ztschr., 46 (1912), No. 1–2, pp. 94–102*).—Either cooling or shaking increased the length of time required to coagulate either milk or skim milk. It is thought that this decreased coagulating capacity is the cause of conflicting results in coagulating experiments. Uniformity can not be expected unless the milk tested has had uniform treatment previous to the experimental work.

Examination of some human milks, G. BROUET (*Sta. Agron. Aisne Bul., 1912, pp. 63–67*).—The author reports physical and chemical constants of 9 samples.

Overheated butter fat, O. LAXA (*Milchw. Zentbl., 41 (1912), No. 22, pp. 673–675*).—Physical and chemical constants before and after heating are reported.

Concerning the lactic acid bacillus (Bacillus casei filans) producing a slimy fermentation, C. Gorini (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. scr., 21 (1912), II, No. 7, pp. 472–474; Milchw. Zentbl., 42 (1913), No. 1, pp. 1–3; Centbl. Bakt. [etc.], 2. Abt., 37 (1913), No. 1–3, pp. 1–3; abs. in Cream. and Milk Plant Mo., 1 (1913), No. 8, p. 31*).—The author isolated a nonmotile bacillus from Parmesan cheese. Its chief characteristics were very active fermentation with the production of ropiness only in the early stages. The optimum conditions for development were from 42 to 45° C., which temperature coagulates milk in 9 to 10 hours, reaching an acidity of from 18 to 22 Soxhlet degrees.

Ropy milk (*Bd. Agr. and Fisheries [London], Leaflet 266, 1913, pp. 1–3*).—Brief notes on methods of overcoming ropiness in milk are given.

[Milk bottles and typhoid fever], A. C. Hunt (*Ann. Rpt. Bd. Health N. J., 35 (1911), pp. 101–113, fig. 1*).—The facts suggested that the milk supply became infected by bottles removed from infected houses, and that this spread the infection.

Official inspections (*Maine Sta. Off. Insp. 44, pp. 165–180*).—An official report of the prosecutions for short weight butter and other offences, of sanitary conditions found to exist in creameries, and other matters relating to state dairy inspection. Suggestions are offered concerning the improvement of sanitary conditions in creameries.

[Experiments in dairying] (*Wisconsin Sta. Bul. 228, pp. 28–33, fig. 1*).—In continuation of earlier work (E. S. R., 23, p. 679), and in cooperation with the Dairy Division of this Department, E. G. Hastings and Alice C. Evans found that coccus forms as well as bacilli were constantly present in large numbers during the ripening of Cheddar cheese. Also, it was found that if too large a proportion of the high-acid bacilli was present the cheese acquired a rank flavor.

Chemical studies on factors involved in the ripening process of cheese were continued by E. B. Hart and E. M. Flint. Representatives of the coccus group during the ripening process produced large amounts of volatile acids. Most of them also produced alcohol, but only two were capable of forming esters. Both coccus and high-acid bacilli were able to produce ammonia. The nonnitrogenous compounds of milk were found to be responsible in part for the production of flavor in cheese.

The causes of mottling of butter have been studied by J. L. Sammis and C. E. Lee, and it has been found that mottling may be produced entirely independent of casein. It is pointed out that thorough working of the butter is necessary to prevent the production of mottling.

A 1 per cent solution of common bleaching powder for deodorizing both the effluent from the septic tank at the creamery and the raw sewage in the drain has been successfully used by E. H. Farrington.

The microflora of Stilton cheese, J. Percival and Miss G. Heather Mason (*Jour. Agr. Sci., 5 (1913), No. 2, pp. 222–229, pl. 1*).—The number of bacteria and fungi in newly made Stilton cheese sometimes rose to the number of from 1 to 3 billions per gram the first week. After that there was a gradual decrease. When thoroughly ripened (in from 100 to 150 days) only from 50 to 100 millions were found.

Lactic acid bacteria predominated in the early stages, but their physiological function was gradually weakened. *Penicillium glaucum* and a form of Torula became more abundant. The 5 characteristic organisms found in all Stilton cheeses were *Streptococcus lacticus*, a short rod-shaped form of *Bacillus acidi lactici*, a species of Tyrothrix, *P. glaucum*, and a round form of Torula, some-

times accompanied or replaced by an oval form. In cheeses where starters were used a large celled form of *S. lacticus* was present. *P. glaucum* was checked in its growth by the Tyrothrix.

VETERINARY MEDICINE.

Veterinary toxicology, G. D. LANDER (*Chicago, 1912, pp. XII+312, figs. 39*).—This work deals with the subject under the headings of mineral or inorganic poisons (pp. 31–92), organic poisons and drugs (pp. 93–138), poisonous plants (pp. 139–274), and chemical toxicology (pp. 275–301).

Concerning the action of eosin on animals (*Arb. K. Gsndhtsamt., 40 (1912), No. 2, pp. 143–208, figs. 11*).—The first part of this paper, by C. Titze (pp. 143–170), deals with feeding experiments with eosin and foods containing eosin; the second part, by E. Rost (pp. 171–208), with a pharmacological investigation of eosin, and a consideration of the action of fluorescein and erythrosin.

Vaughan's "split" products and unbroken proteids.—A comparative study of their effects, E. J. BANZHAF and EDNA STEINHARDT (*Collected Studies Research Lab. Dept. Health N. Y. City, 6 (1911), pp. 154–169; abs. in Rev. Bact., 2 (1912), No. 4, p. 104*).—"Vaughan has shown that fat-free proteins when heated at a temperature of 78° C. with absolute alcohol, containing 2 per cent of sodium hydrate, break up into toxic and nontoxic fractions, the former being soluble in the alcohol and the latter insoluble.

"The toxic product when injected intraperitoneally into guinea pigs is fatal, and the toxic symptoms are identical with those of serum anaphylaxis. The toxic product is not specific; the nontoxic product is specific and sensitizing. The toxic split product derived from egg albumin causes, when injected into normal animals, the same symptoms as those following the injection of a whole horse serum into a sensitized animal. If a horse serum is heated at 100° for 15 minutes, its toxicity for a sensitized animal is destroyed. The toxicity of the split product is not destroyed by heating at that temperature, but is destroyed in part by heating at a temperature of 120° for 15 minutes.

"Chloral hydrate protects against a single lethal dose of the toxic split product, but not against multiple doses. The effects of the injection of mixtures of chloral hydrate and the toxic product are irregular. Various quantities of lecithin mixed with the minimum lethal dose do not have any neutralizing effect.

"The residue (Vaughan), the nontoxic product, sometimes has sensitizing properties; the residue from egg albumin had not any protective properties. The writers consider that some of the modifications of the residue described by Vaughan are explainable by the action of heat; on heating the toxic and protective properties are lost first, the sensitizing properties later. Similar loss of properties on heating is observed in the case of the whole protein."

About the specificity of the complement fixation reaction with alcoholic extracts of the parasite.—Antigenic properties of lipoids, K. MEYER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 14 (1912), No. 3, pp. 355–358*).—The complement fixing reactions obtained with alcoholic parasite extracts react with the sera of carriers of parasites (tapeworms), and with the sera of rabbits immunized with parasite extracts. The reactions are strongly specific.

Some further studies on the diagnostic value of the ophthalmo reaction in glanders, E. FRÖHNER (*Monatsh. Prakt. Tierheilk., 23 (1912), No. 10–11, pp. 433–454; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 8, p. 136*).—This is a continuation of the work previously noted (E. S. R., 27, p. 578), and represents tests made with 41 horses which were either glandered or suspected of having glanders. Most of the animals pronounced glandered on the basis of

the eye test were found so on necropsy. In 1 case the reaction was negative in an animal found glandered on section, but the agglutination and complement fixation tests were positive in this instance.

The abstract contains a criticism by W. Pfeiler.

Further testings of the hemorrhagic septicemia antiserum and vaccine, J. D. E. Holmes (*Indian Civ. Vet. Dept. Mem.* [*1912*], *No. 3, pp. 242–247*).—In the tests bulls, buffaloes, ponies, mules, and rabbits were used.

In regard to hemorrhagic septicemia antiserum, the following conclusions were drawn: "The serum confers an immediate protection against the inoculated virus. The immunity following an injection of serum was tested and found satisfactory up to 4 weeks. The injection of a suitable dose of serum protects in not less than 90 per cent of cases. A small percentage of animals can not be protected even by large doses of serum. A potent serum gives immunity in doses which vary according to the size and species of the animal."

For hemorrhagic septicemia vaccine it is shown that "the vaccine is innocuous. In some cases the injection caused a slight swelling at seat of inoculation which disappeared in a few days. It confers protection against the inoculated virus for a period of from 4 to 6 weeks. The protection is not immediate. It sets in about 4 days following the injection of the vaccine. The vaccine protects in about 75 per cent of cases. The dose of vaccine varies from 5 to 10 cc. according to the size of the animal. A like dose appears to be required for cattle, buffaloes, ponies, and mules."

Rabies; a pathognomonic sign generally overlooked, M. B. Wesson (*Jour. Amer. Med. Assoc., 60 (1913), No. 14, pp. 1069, 1070*).—The author reports cases which call attention to the characteristic development of the paralysis of rabies as noted in a series of animals, including man, dog, hog, guinea pigs, and rabbits.

"The initial site of paralysis was the 'left hind leg,' and this in a short time developed into a left hemiplegia, the paralysis eventually becoming general. In an animal that has suddenly become extremely nervous and irritable, the development of a weakness in the left hind leg, without any apparent reason, is sufficient to warrant a tentative diagnosis of rabies."

On the immune bodies occurring in rinderpest immune serum.—I, The precipitation of the rinderpest immune bodies by dialysis of the immune serum, P. Hartley (*Indian Civ. Vet. Dept. Mem.* [*1912*], *No. 3, pp. 216–230*).—"When rinderpest immune serum is dialyzed, the immune bodies are precipitated. The filtrate from the dialyzed serum fails to protect susceptible animals from the disease. By this process the rinderpest prophylactic can be prepared in the dry condition. The tests of the dried powder which have been carried out show that the loss of immune bodies is inappreciable and that the dried powder, when dissolved or emulsified and injected into susceptible animals, protects from a simultaneous inoculation of virulent rinderpest blood. By this method about half of the total proteids, which take no part in the immunizing process, are eliminated. The rinderpest immune bodies differ from diphtheria and tetanus antitoxins. The former appear to be similar to the insoluble globulins (euglobulins); the latter are similar to the soluble globulins (pseudoglobulins)."

Report on the preparation of rinderpest antiserum by means of diluted virulent fluids, P. Hartley (*Indian Civ. Vet. Dept. Mem.* [*1912*], *No. 3, pp. 231–241*).—"The tests show that the sera prepared by the routine method are potent sera, while those prepared by the injection of diluted virulent material, peritoneal fluid, or virulent blood, are sera of low potency. The serum prepared by the routine 'peritoneal washings' method is more potent than that made by the routine 'virulent blood' method. The results are in accord with those

obtained in the Philippine Islands, but different from those previously obtained in this laboratory, [which] have shown that the peritoneal fluid has about half the potency of virulent blood serum."

The vaccine against Texas fever, J. LIGNIÈRES (*Le Vaccin de la Fièvre du Texas ou Piroplasmose Bovine. Buenos Aires, Min. Agr., 1911, pp. 16*).—This publication deals with the different factors which led up to the discovery of the author's vaccine. The methods of preparing it, for immunizing bovines, and the amounts to be given, are minutely described. See also a previous note (E. S. R., 27, p. 184).

Antiperistalsis in its relation to tubercle bacilli and other bacteria in the alimentary tract, A. F. HESS (*Collected Studies Research Lab. Dept. Health N. Y. City, 6 (1911), pp. 281–289*).—"A review of the experimental data shows that after the *Bacillus prodigiosus* had been given by rectum to rabbits it was rarely found in the alimentary tract above the ileocecal valve. In one instance it was recovered from the small intestine, but never from the stomach or from the esophagus. It was, however, found in the blood, in the kidneys, in the lungs, in the liver, and in the bile. It was recovered from the blood in all but one instance, namely in the first experiment, in which the technique was not yet well developed. From these results it seemed clear that this organism when introduced per rectum was readily absorbed from the intestinal canal. It therefore seemed a logical deduction that the bacilli gained access to the kidneys, lungs, liver, and bile by way of the blood current. . . .

"The employment of the *B. tuberculosis* for these experiments is somewhat unsatisfactory because many of the guinea pigs made use of to show the presence of this organism in the various organs (intestines, lungs) succumb to secondary infections. In 2 experiments where the rabbits were killed a few hours after the rectal injections of tubercle bacilli, once of a suspension of bacilli of the human type, another time of bacilli of bovine type, the bacilli could not be demonstrated in the small intestine, stomach, or esophagus.

"In 2 other experiments where 24 hours were allowed to elapse following the rectal injection and previous to killing the animal, the tubercle bacillus was found in the blood. In one of these it was demonstrated also in the mesenteric glands, which clearly indicated its route from the intestines to the blood stream. It should be noted that in this experiment tubercle bacilli were found in the stomach. There is no means of deciding whether their presence in this organ was due to antiperistalsis or whether they gained access by way of the blood. It may, however, be mentioned in this connection that when tubercle bacilli are injected into the blood they are to be found in the stomach as well as in the small intestine within a few hours.

"One clinical test was [also] made [with] a 'typhoid carrier.'"

Studies in regard to the histogenesis of the lymphatic gland tubercle, and the early stages of tuberculosis of the lymphatic glands, E. JOEST, E. EMSHOFF, and W. SEMMLER (*Berlin. Tierärztl. Wchnschr., 29 (1913), Nos. 4, pp. 57–59; 5, pp. 73–77; Ztschr. Infektionskrank. u. Hyg. Haustiere, 12 (1912), No. 2, pp. 117–136*).—This article describes the results of an investigation of the microscopic and macroscopic changes which take place as a result of infecting the lymphatic glands localized in the iliac, subiliac, and inguinal regions by the bovine and human type of bacillus.

Lymphatic gland tuberculosis is considered a distinct focal disease, which egins in the fixed tissue cells (reticular cells) and increases by mitotic ision. The youngest form of lymphatic gland tubercle is an epithelioid ll tubercle, and occurs in this form in both the guinea pig and bovine. The

parenchyma of the lymphatic glands takes no part in the pathological process, but the lymphocytes undergo degeneration (pyknosis). Exterior to the tubercle the parenchyma is normal, and as a rule shows no hyperplasia. Exudation processes could not be noted in the formation and further development of the tubercle in the guinea pig. In fact, all inflammatory evidences were lacking. Tubercle formation is brought about by the metabolic products elaborated by the tubercle bacillus. These stimulate the reticular cells to prolification, resulting in the formation of epithelioid cells, and this leads to the destruction of the lymphocytes.

No prelymphoid stage, used in the sense designated by Bartel, occurred in the bovine or guinea pig when tuberculosis of the lymphatic glands was induced by injection of tubercle bacilli of medium virulence. No latency of the tubercle bacilli in the lymphatic gland tissue was noted.

Certain important biological differences were noted between the human and bovine type of bacillus. When the human type of organism was given intramuscularly, it was found within from 24 to 48 hours in the lymphatic glands located in that region; when the bovine type was injected in the same way, it was found only 5 days post infection. This is attributed to certain differences in the protoplasm of the respective bacteria.

Bovine tuberculosis and its control, V. A. Moore (*Ithaca, N. Y., 1913, pp. X+134, pls. 31*).—This volume deals with the history of tuberculosis in cattle, the distribution and economic and sanitary importance of bovine tuberculosis; the cause of tuberculosis in cattle; the nature of tuberculosis and the changes produced in the tissues by tubercle bacteria; symptoms of tuberculosis in cattle; methods of dissemination; the diagnosis of tuberculosis in cattle; tuberculin and its use; physical examination in detecting tuberculosis in cattle; immunization of cattle against tuberculosis; the control of bovine tuberculosis; and the report of the International Commission on the Control of Bovine Tuberculosis. It is illustrated with reproductions from photographs of tubercle bacilli and pathologic preparations.

A comprehensive bibliography is appended.

Avian tuberculosis, E. G. Hastings and J. G. Halpin (*Wisconsin Sta. Research Bul. 28, pp. 249–271, pls. 7*).—Since 1906, and especially within the last 3 years, a considerable number of avian tissues showing tuberculosis have been sent to the station for examination. From the data collected it is concluded that avian tuberculosis is prevalent in certain portions of the State, and severe losses have been sustained in some cases.

The birds in which the disease visibly occurs are usually over a year old, and when young birds are infected, deaths among them may not occur until the following season. Out of 29 naturally infected birds examined, 14 which died as a result of the disease showed lesions located particularly in the liver, spleen, and intestines. The lungs were infected in only 6 cases in addition to the other tissues. "Of the skeleton, the only parts found affected have been the breast bone and ribs. In one case a number of tubercles were found on the gizzard."

As the lungs are seldom involved, the bacteria are generally discharged with the feces. The appearance of the tissues of the various organs are described. "The differential diagnosis of tuberculosis in hens from other diseases in which nodules are present, such as may be produced by parasites in the walls of the intestines, can easily be made on account of the constant occurrence of liver and spleen lesions in the case of tuberculosis. In the absence of these one will not go far astray in diagnosing the trouble as nontubercular."

Some feeding experiments showed that the disease could be easily produced in this manner, thus confirming the work of other authors.

Hens known to be healthy were allowed to run in a limited enclosure with tubercular hens, practically all affected with the open type of the disease with involvement of the liver, kidneys, and intestines. Some of the healthy birds later became tubercular. "The avian tubercle organism was easily isolated in pure culture directly from the lesions of the birds. In 9 cases out of 10, attempts to isolate the organism from the tissues of the hens examined, were successful. Dorset's egg medium and in some cases glycerin agar, were used." All of the cultures developed membranes when grown in a liquid medium. Growth was also obtained on beef extract-peptone agar; the growth was less profuse than on glycerin agar.

"In the work a large number of guinea pigs have been injected with tubercular tissues or with pure cultures, and in nearly all cases lesions have been produced." Inoculations of guinea pigs were made with the tissues of an infected fowl, and out of 7 guinea pigs, all of which became tubercular, 4 died as a result of the disease. In addition, positive results were obtained with 15 out of 17 guinea pigs inoculated with the tissues of tubercular fowls. The immense number of organisms noted in the lesions of fowls were also found to be present in the guinea pigs treated, but the tissue changes were not so extensive as they occur in fowls.

"In a portion of the cases the inoculation of guinea pigs has resulted in the production of the 'Yersin' type of tuberculosis, in which the macroscopic lesions are not indicative of the extent of the disease, and in which tubercle bacilli are present in apparently healthy organs. . . . Seven guinea pigs were inoculated subcutaneously or intraperitoneally with pure cultures of avian tubercle bacilli. In 6, positive results were obtained. Four of the animals died in 27 to 63 days. But one rabbit was inoculated with the tissues of fowls. This animal was killed on the one hundred and fifty-sixth day. The only lesions found were minute tubercles on the cecum in which tubercle bacilli were present in large numbers. A number of rabbits were inoculated with pure cultures. In some cases death from generalized tuberculosis resulted in 29 to 55 days. In other cases the disease was less extensive. . . . Pigeons were inoculated with pure cultures. Positive results were obtained. . . . One rabbit was fed twice on avian tissues. When killed on the one hundred and fifty-fifth day small tubercles were found on the cecum and one on the small intestine. Tubercle bacilli were abundant in the lesions."

For the purpose of studying the relation of avian tuberculosis to tuberculosis in hogs, 4 hogs were fed with avian tubercular tissue. In all cases tubercular lesions were found on slaughter from 5 to 6 months later. The lesions were confined to the cervical and mesenteric glands. Feeding the bovine type of organism under the same conditions results in much more extensive lesions, and whether the avian type can produce lesions of the same magnitude so as to condemn the carcass as unfit for food is considered open to question.

One hen was fed on a mixture of human tubercular sputum and corn meal 25 times, with negative results. The authors were "unable to kill hens, rabbits, and guinea pigs infected with avian cultures by the use of mammalian tuberculin known to be effective when used on cattle. . . . Two of the hogs fed on avian tubercle bacilli were injected before slaughter with mammalian tuberculin. No thermal effect was produced. . . . While it has been shown that it is possible to produce tuberculosis in mammals with the organism from an avian source, from a practical point of view the disease is of economic importance, not because of this possibility, but because of the losses it entails on

the poultry industry. There is little reason for believing that the disease in fowls has a hygienic significance for man."

About the specificity of the complement fixation reaction in tuberculosis.—Antigenic properties of lipoids, K. MEYER (*Ztschr. Immunitätsf. u. Expt. Ther., I, Orig., 14 (1912), No. 3, pp. 359–368*).—The specific complement fixing property is in 2 fractions of the tubercle bacillus, which are both soluble in benzol, petroleum ether, and ether, and insoluble in acetone. Of these 2 fractions, 1 at least is formed from the phosphatids. The other fractions, which are composed of fats, fatty acids, and wax, gave only a slight complement fixation with Höchst's serum.

Tubercle bacilli which were fully extracted reacted only mildly with the serum.

Investigation in regard to the influence of external and internal diseases upon the enzym content of milk, C. VOLLBATH (*Untersuchungen über den Einfluss äusserer und innerer Krankheiten auf den Enzymgehalt der Kuhmilch. Inaug. Diss., Univ. Stuttgart, 1912; abs. in Berlin. Tierärztl. Wchnschr., 29 (1913), No. 8, pp. 140, 141*).—The oxidase and peroxidase content of milk is not influenced by disease from within or without. Diastase suffers only a slight variation. In foot-and-mouth disease an increase in the reductase and catalase content takes place, and this rise is also noted some time after the pathological process has apparently ceased. In some other cases (pustules, retention of the secundines, indigestion, or traumatic pericarditis) a slight increase in the reductase and catalase is noted.

The enzym method is deemed of no value for diagnosing external or internal diseases other than mastitis or foot-and-mouth disease. No parallelism was noted between the catalase and reductase.

A contribution to the knowledge of the occurrence of sarcosporidia in the domestic animals, A. M. BERGMAN (*Ztschr. Fleish u. Milchhyg., 23 (1913), No. 8, pp. 169–180, fig. 1*).—This paper reports studies of the occurrence of sarcosporidia in cattle, horses, sheep, swine, and reindeer.

Experimental researches on the development of Fasciola hepatica, A. RAILLIET, G. MOUSSU, and A. HENRY (*Rec. Méd. Vét., 90 (1913), No. 1, pp. 1–6, fig. 1*).—The authors find that *F. hepatica* does not develop when the embryos are introduced directly into the body.

A contribution to the knowledge of the effects of gestation and of parturition on the body of the cow, P. STAPEL (*Beitrag zur Kenntnis der Einflüsse der Trächtigkeit und des Partus auf dem Organismus beim Rind. Inaug. Diss., Univ. Bern, 1912, pp. 53, pls. 7*).—The author first reviews the literature on the subject and then reports investigations carried on. He deals with the body temperature, pulse, respiration, urine, and percussion. A bibliography of the literature referred to, consisting of 44 titles, is appended.

The normal flora of the genitalia of female cattle, C. KUNST (*Die normale Flora der Genitalien beim weiblichen Rinde. Inaug. Diss., Univ. Bern, 1911, pp. 58*).—A bacteriological study.

On the occurrence of micro-organisms in the mesenteric glands of normal cattle, G. G. J. WESTHOLZ (*Ueber das Vorkommen von Mikroorganismen in den Mesenterialdrüsen des normalen Rindes. Inaug. Diss., Univ. Bern, 1912, pp. 145*).—The author finds that in many perfectly normal animals micro-organisms which occur in the alimentary canal are to be found in the mesenteric glands, but the number of these micro-organisms with the exception of *Bacillus subtilis* is very small. A bibliography of 101 titles is appended.

Trypanosomes found in a cow in England, A. C. COLES (*Parasitology, 5 (1913), No. 4, pp. 247–252, pl. 1*).—This paper reports the finding of trypanosomes in the blood of a cow suffering from piroplasmosis in Dorset.

Croupous enteritis in cattle caused by Bacillus enteritidis, MESSNER and KOHLSTOCK (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 65* (*1912*), *No. 1–3, pp. 38–41*).—The authors report upon the occurrence of *B. enteritidis* as the cause of croupous enteritis of cattle.

Experimental contribution on anthrax infection in swine, A. MAAG (*Experimentelle Beiträge zur Milzbrandinfektion beim Schwein. Inaug. Diss., K. Tierärztl Hochsch. Stuttgart, 1911, pp. 38*).—Feeding experiments with gelatin capsules, and subcutaneous, intraperitoneal, and intragastric injections show that swine possess relative high immunity against the disease, although the immunity is not absolute.

A plerocercoid of the hog, S. VON RÁTZ (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 67* (*1913*), *No. 7, pp. 523–527, figs. 3*).—A new plerocercoid found in the hog in Hungary is described as *Sparganum raillieti.*

Concerning a baccillus of the paratyphosus B-enteriditis group as the cause of infectious abortion in the mare, D. A. DE JONG (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 67* (*1912*), *No. 3, pp. 148–151*).—A bacillus of the paratyphosus B-enteriditis group isolated from aborted foals was agglutinated by serum of aborted mares in dilutions even greater than 1:1.000, by normal serum only up to 1:300. Injected intravenously the bacillus produced abortion in cows and mares and was again isolated from the aborted fetuses. Abortion was also brought about through the feeding of cultures.

Forage poisoning or cerebro-spinal meningitis, J. R. MOHLER (*Amer. Jour. Vet. Med., 8* (*1913*), *No. 2, pp. 98–106*).—This summarized account includes a general discussion of the results of investigations carried on by the Bureau of Animal Industry of this Department.

Of the many terms applied to this disease, the author prefers that of cerebro-spinal meningitis for the scientific term and blind staggers for the lay term. It is stated that no specific bacteria, fungus, virus, or other toxic principle has yet been found that can be considered the cause of this disease in the horse, the 4 rules laid down by Koch not having been met with in sufficient regularity to make the results satisfactory to the disinterested worker. "We found micrococci, diplococci, streptococci, and staphylococci so frequently in the brains of horses which have died of dourine, swamp fever, influenza, etc., that we have come to consider these organisms as representing an agonal invasion from the intestines without causal connection with any definite disease."

With a view to obtaining additional information as to the significance of the presence of the various cocci to the disease, an antigen was prepared from a culture of each organism and tested against the blood serum obtained from affected horses in the field for complement fixation and agglutination as in glanders; in no case was a positive reaction to these tests obtained by the use of any of the antigens prepared from the different cocci isolated from diseased horses. A large number of brains from affected horses were examined in the laboratory for the nuclear inclusions described by Joest and Degen as occurring in the nerve cells of the hippocampus but with negative results, although the same technique applied to the brains of rabid animals brings out the Negri bodies with great clearness.

The author discusses the theory of poisoning due to fungi on the feed. Forage poisoning "seems to be an autointoxication rather than an infection and due to certain chemical poisons or toxins formed by organismal activity. These toxins may be present when the forage is taken into the body or formed in the gastro-intestinal canal and therefore, the disease is a specific form of autointoxication. The nature of the substance which causes these harmful changes or the poisonous bodies that are formed, remains unknown."

"A comparative microscopic examination of the brains of horses which died in Kansas, New Jersey, Maryland, and Virginia this year with those of horses from previous outbreaks showed the same characteristic perivascular round-cell infiltration, especially in the olfactory lobe and the hippocampus. The piamater showed an increased amount of connective tissue with dense round-cell infiltration which extended into the adjacent cortical portion of the cerebrum. The capillary blood vessels were engorged with cells and their walls were greatly infiltrated. Limited areas of leucocytic infiltration and small hemorrhages in the brain tissue were not infrequently observed. No cellular inclusions in the ganglionic cells were detected after prolonged examination."

"While medicinal treatment has proved unsatisfactory in the vast majority of cases, nevertheless the first indication is to clean out the digestive tract thoroughly, and to accomplish this, prompt measures must be used early in the disease. . . . Arecoline in ½ grain doses intravenously has given as much satisfaction as any. After purging the animal the treatment is mostly symptomatic." Mention is made of the success obtained from the use of diphtheria antitoxin as a prophylactic treatment, not one of more than 500 animals injected at Kearney, Nebr., having been attacked. It is thought, however, that with this treatment, as with others, the good results may have been due to the fact that the disease was on the wane before the treatment was commenced.

Strongyles of the horse, B. F. KAUPP (*Amer. Jour. Vet. Med., 7 (1912), No. 11, pp. 482–488, pls. 4*).—This paper deals with the anatomy and biology of the species of Sclerostomum, Triodontophorus, and Cylichnostomum occurring in the horse.

Encephalo-embolic strongylosis or encranial strongylogenic embolism (*Amer. Jour. Vet. Med., 7 (1912), No. 12, pp. 535–544*).—This is a detailed discussion of the disease which became epidemic in Kansas and neighboring States during the late summer of 1912, and its probable cause.

A disease of mules simulating glanders, D. P. L. EDWARDS and A. IRELAND (*Vet. Jour., 69 (1913), No. 452, pp. 70–79, fig. 1*).—The authors describe a disease of mules observed at Naselai, Fiji, which simulates glanders. From the studies reported they conclude that it is not due to *Bacillus mallei* but that the causative organism belongs to a closely allied group.

An outbreak of an acute disease in adult fowls due to Bacterium pullorum, F. S. JONES (*Jour. Med. Research, 27 (1913), No. 4, pp. 471–479*).—Studies made during an outbreak of disease at a large poultry farm have led the author to the following conclusions: "*B. pullorum* under certain conditions seems to be pathogenic for adult hens. The disease was produced by the feeding of incubated eggs that contained *B. pullorum*. The disease is a true septicemia having a somewhat constant group of lesions. The lesions usually found were minute necrotic foci in the liver, spleen, and pancreas, and larger necrotic nodules in the heart muscle. The presence of a fibrinous exudate in the capsule of the liver and spleen and on the pericardium and heart was a somewhat constant lesion."

The value of the macroscopic agglutination test in detecting fowls that are harboring Bacterium pullorum, F. S. JONES (*Jour. Med. Research, 27 (1913), No. 4, pp. 481–595*).—The following conclusions have been drawn from the studies reported:

"The macroscopic agglutination test is of great value in detecting fowls that are harboring *B. pullorum* in their ovaries. The practicability of the test rests on the value of the fowls. The lower serum dilutions (1:50, 1:100, 1:200) are recommended for practical purposes. The blood serum of all infected fowls agglutinated at a dilution of 1:100. The serum of 91 per cent agglutinated at

a dilution of 1:200, and 82.3 per cent agglutinated at a dilution of 1:500. Certain individuals gave a positive reaction with serum dilutions of 1:800, 1:1,000, 1:1,500, and 1:2,000. The best results were obtained with a test fluid made from several freshly isolated strains of *B. pullorum*.

"The ovaries of fowls harboring *B. pullorum* are not always pathological. In 75 per cent of the spreaders, the ovary was found to be cystic. In the remainder the organ was apparently normal. *B. pullorum* is easily recovered from the cystic ovary. In fowls that have agglutinated, but fail to reveal any marked pathological changes in the ovary, the following technique is recommended: The ovary is removed, using aseptic precautions, to a sterile Petri dish. It is then cut into several small pieces. The pieces are crushed with a sterile spatula and dropped into tubes of sterile bouillon. The tubes are allowed to incubate 24 hours at 37.5° C. From this suspension pure cultures may be obtained either by the plate method or the inoculation of slant agar tubes."

External parasites of birds, B. F. KAUPP (*Amer. Jour. Vet. Med., 8 (1913), No. 4, pp. 200–207, figs. 16*).—This is a descriptive account of the more important ecto parasites of domestic fowls, the injury they cause, and remedial measures therefor.

RURAL ENGINEERING.

Farms and acreage irrigated, irrigation works, cost of construction, cost of operation and maintenance, and crops grown under irrigation, R. P. TEELE (*Bur. of the Census [U. S.] Bul., Irrig. U. S., 1910, Abs.-Farms, etc., pp. 421–432*).—This bulletin reports data from the Thirteenth Census which deals with the arid region, including all sections of the United States where irrigation is generally practiced in the growing of farm crops, and giving a separate report on the irrigation of rice in Louisiana, Texas, and Arkansas.

Of the approximate land area in the arid region, 1,161,385,600 acres, 173,433,957 acres were found to be improved land in farms, an increase since 1900 of 11.4 per cent. The acreage irrigated in 1909 was 13,738,485 acres, an increase since 1900 of 82.7 per cent. Acreage enterprises were capable of irrigating 19,334,697 acres, and 31,111,142 acres were included in projects. The total number of enterprises was 54,700, with a total length of ditches of 125,591 miles, 6,812 reservoirs with a capacity of 12,581,129 acre-feet, 5,070 flowing wells, 14,558 pumped wells, and 13,906 pumping plants, with a total power plant capacity of 243,435 h. p. The acreage irrigated with pumped water in 1909 was 477,625 acres, and that irrigated from flowing wells 144,400 acres.

The cost of irrigation enterprises has aggregated $307,866,369, an increase since 1900 of 359.8 per cent. This gives an estimated average cost per acre of $15.92. The average cost per acre of operation and maintenance in 1909 was $1.07, an increase since 1900 of 181.6 per cent.

The total acreage of crops is given as 7,241,561, with a total value of $181,617,396, making an average value per acre of $25.08. In acreage alfalfa ranked first, with 30.6 per cent of the total reported; wild, salt, or prairie grasses second, with 21.1 per cent; and oats third, with 10.2 per cent. Forage crops taken together occupy about 63 per cent of the total reported acreage, cereals about 23 per cent, sugar beets 2.5 per cent, potatoes 2.3 per cent, fruit crops about 5 per cent; and all other crops 4.6 per cent.

Among crops grown on irrigated land the tropical fruits lead in average value per acre by a wide margin. Orchard fruits and grapes ranked second, then potatoes with an average value of $60.03, sugar beets with $57.29, and alfalfa $22.94.

The total acreage irrigated for rice growing in the 3 States was 694,800 acres, of which 54.7 per cent was in Louisiana, 41.3 per cent in Texas, and 4

per cent in Arkansas. The estimated total cost of enterprises completed or under way in 1910 was $13,667,639, or $12.05 per acre for the land included in these enterprises. The average yields of rice per acre and value per acre for the three States are as follows: Louisiana, 34.6 bu. at $25.70; Texas, 38.7 bu. at $28.54; and Arkansas, 45.9 bu. at $41.56.

Irrigation (*New Mexico Sta. Rpt. 1912, pp. 18–22*).—A study of the movement of underground water of the Mesilla Valley has indicated that since this is a moving body of water, and the water table rises each year because of the river and irrigation water, little or no effect will be made on the permanent underground supply by an excess of pumping plants. The equipment for and the methods of experiments used to obtain reliable data on the flow of water through submerged orifices are described, the main object being to determine the coefficient of contraction to be applied to the formula of flow.

Seasonal duty of irrigation water, F. W. Hanna (*Engin. Rec., 67 (1913), No. 4, pp. 90, 91*).—This article gives the results of observations and experimental work in the Boise Valley, Idaho, on the duty of water for the irrigation of hay, grain, pasture, orchards, and combinations of the same. These show that there is a variable requirement for water throughout the irrigation season. It is low at the beginning of the season, increasing with its advance until about the middle of July, then decreasing during the remainder of the season. The use of water under a seasonal water duty, based on this variable crop requirement, will amount to less than one-half the amount of water required by the common duty of water, based on a continuous flow equal to the maximum seasonal rate. It is further noted that where seasonal duty of water is practiced a system of rotation of water delivery is essential to good service.

Selling water by current meter measurement, J. C. Allison (*Engin. News, 69 (1913), No. 2, pp. 66–70, figs. 5*).—This article describes a large private irrigation system which supplies water to 245,000 acres of land in the Imperial Valley of southern California, and notes tests and the subsequent use of some 25 to 30 current meters on the 66 main line delivery canals. This departure in the measurement and sale of irrigation water was made necessary by the large volume of silt carried by the water, and the increased necessity for accurate measurement due to the high value of water.

A year's strict tests of this method brought out 2 significant facts: (1) The overcoming of the opposition to the use of current meters on the part of the mutual water companies and of the farmers which composed them, and (2) the part which the more accurate measurement of the water and also the more perfect control of its distribution has played in putting a once bankrupt property on a paying basis.

On the accuracy of stream measurement, J. I. Craig (*Cairo Sci. Jour., 6 (1912), No. 75, pp. 279–284, fig. 1*).—The results of experimental work in stream gaging indicate that most of the systematic errors of this work are in the direction of giving too high discharges. These are due principally to (1) sag of the transverse cable, (2) sag and drift of the sounding line, (3) neglect of the angle between the transverse cable and the actual local direction of the water, (4) use of meters, and (5) pitching of the boat during measurement. Methods are outlined whereby these errors may be mathematically computed and corrected for.

Economical irrigation by pumping (*Aurora, Ill., 1912, pp. 71, figs. 71, pl. 1*).—It is the purpose of this pamphlet to give information relative to types of pumps best adapted to meet different irrigation conditions and at the same time keep pace with the rapid improvement in the designs of pumping machinery. Recommendations are made of installations for different localities

from the experimental work of hydraulic engineers, and short descriptions are given of several installations in operation. Considerable space is devoted to methods of applying water, collated from publications of this Department, with the idea of aiding the irrigator to determine which is best adapted for his requirements and his source of water supply.

Centrifugal pumping plants for irrigation and drainage, H. L. HUTSON (*Jour. Assoc. Engin. Soc., 48 (1912), No. 5, pp. 209–239, figs. 2*).—The author first describes the types of machinery best adapted to irrigation pumping plants, and then states from his investigations what will be the modifications necessary to adapt the same types of equipment for drainage work.

Tile drainage (*Wisconsin Sta. Bul. 228, pp. 21, 22*).—The results of investigations by E. R. Jones on the efficiency of drainage systems indicate that where the subsoil is of clay, mains with a capacity to remove 0.25 in. of rainfall for 24 hours are sufficient. Where springs have been also drained the maximum discharge has been as high as 0.9 in. in 24 hours. This emphasizes the fact that in determining the amount and size of tile it is necessary to consider fully the peculiarities of the area.

Synopsis of laws relating to drainage in the State of Louisiana (*New Orleans, 1910, pp. 27*).—This pamphlet gives a synopsis of the acts of the General Assembly of the State of Louisiana relative to the organization and operation of drainage districts in the State, and includes the text of Act No. 317.

Official proceedings of the second annual meeting of Association of Drainage and Levee Districts of Illinois (*Off. Proc. Assn. Drain. and Levee Dists. Ill., 2 (1912), pp. 85*).—The proceedings of this meeting include papers on the Reciprocal Duties and Obligations of Drainage and Levee Districts in Illinois, by W. Pease; Underdrainage of Alluvial Lands, by J. A. Harmon; Drain Tile, Its Uses, Manufacture, and Distribution in Illinois, by J. A. Reeves; The Drainage Problem of the United States, by E. T. Perkins; Some Drainage Problems of Southern Illinois, by J. G. Mosier; and Dams and Locks in the Lower Illinois River, by L. E. Cooley, in connection with a report on the improvement of the lower Illinois River.

Brick on country roads, W. C. PERKINS (*Municipal Engin., 44 (1913), No. 2, pp. 107–113, figs. 18*).—This paper, presented before the American Association for the Advancement of Science, relates the methods employed by the New York State Highway Commission in the selection of material for and the design and construction of brick surfacing for country roads. It states that in the experience of this commission a macadam road under heavy traffic is not economical on account of the high cost of maintenance and that in comparison brick makes an ideal road for heavy traffic and is smooth, dustless, sanitary, and durable.

Descriptive catalogue of the road models of the Office of Public Roads (*U. S. Dept. Agr., Office Pub. Roads Bul. 47, pp. 29, pls. 17, fig. 1*).—This is a revision of Bulletin 36 previously noted (E. S. R., 25, p. 891), to which have been added a brief review of the history of the Roman, French, Macadam, and Telford methods of road making, and illustrations of the construction of concrete and asphalt block roads.

Ninth biennial report of the state engineer, Idaho, A. E. ROBINSON ET AL. (*Bien. Rpt. State Engin. Idaho, 9 (1911–12), pp. 542, figs. 7, pls. 17*).—This report deals with highways, bridges, stream gagings, and especially with irrigation works in the State, which include private construction, Carey Act and other U. S. Reclamation Service projects, and the work of the Irrigation Investigation Division of this Department. The principal irrigation engineering features discussed are dams, canals, reservoirs, measurement and distribution of water, and duty of water. A large amount of statistical, hydrographic,

water duty, construction, and other data with maps and illustrations accompany the report.

The 1912 irrigation statistics of the State, given by counties, show the following totals: Miles of canal, 11,884; cost of construction, $39,341,285; acres under canal, 3,153,512; and acres cultivated, 1,647,430.

Metamorphism of Portland cement, A. B. PACINI (*Ann. N. Y. Acad. Sci., 22 (1912), pp. 161–224*).—This paper is in 2 parts. Part 1 gives a brief review of the present status of the investigations covering the changes which take place in the setting and hardening of Portland cement, and in Portland cement which may be considered to have attained the greatest part of its maximum hardness. Part 2 gives the results of a series of laboratory experiments on the various points discussed in part 1, and which indicate in general the following conclusions:

"(1) Increase of temperature of the water with which cement is mixed causes acceleration of the set up to a certain maximum temperature, then a retardation. (2) Storage in cold water, without freezing, retards the hardening of neat cement, and that of mortars more. (3) Increase in the proportion of fine particles in a cement decreases the permeability of mortar made therefrom. (4) Mechanical agitation increases the strength of cement up to a certain maximum time; after which, if continued, it reduces it. (5) The setting of cement is accelerated by dryness of the atmosphere. (6) An excess of mixing water progressively reduces the strength of cement. This effect is partly reversive of itself, and the reversion may be increased by additional colloidal material in the original cement. (7) Water percolating through concrete dissolves the lime of the cement chiefly, and this effect tends to neutralize itself by 'healing'. (8) Percolation through concrete preferably follows the bedding planes. (9) Salts in solution in the mixing water tend to lower the strength of cement. This effect may be neutralized by precipitation in the pores. (10) Storage in saline water affects low silica cements more than it does high silica, and coarsely ground cements more than it does finely ground cements."

Equalizers for plows, E. A. WHITE (*Amer. Thresherman, 15 (1913). No. 10, pp. 44, 45, 48, 49, figs. 11*).—The author gives the results of investigations of various plow hitches and shows that the fallacy of the abreast hitch lies in the fact that the center of draft is not in line with the center of load. He advocates the use of the tandem hitch, in connection with suitable equalizers to lower the center of draft on the front team, as a means to eliminate side draft and undue strain on the plow beam and frame.

Factors affecting the draft of plows, P. S. ROSE (*Amer. Thresherman, 15 (1913), No. 10, pp. 16, 17, figs. 5*).—This article gives curves and tabulated results of several series of draft experiments with plows. From one series of experiments in sandy loam 5 curves are shown, representing the draft of two 14 in. plows, two 16 in. plows, and one 18 in. plow, representing both the turf and stubble bottom types, and plowing at depths varying from 4 to 8 in.

The curves are all practically parallel, showing that the increase in draft is the same with any size or style of plow, but they also show that doubling the plowing depth increases the draft from 70 to 80 per cent, and that for the same depth an increase of 28.57 per cent in the plow width increases the draft almost 75 per cent. The average draft of 13 tests of a walking plow in medium heavy loam was 599.47 lbs. and for a sulky plow 671.44 lbs.

The average drafts and horsepower hours required to plow an acre of sandy loam at depths varying from 4 to 8 in. with 14 and 18 in. plows are also given. The drafts for a 14 in. plow vary from 240 to 430 lbs., and for an 18 in. plow from 480 to 720 lbs. The horsepower hours in this case for the 14 in.

plow varied from 4.5 to 8.1 and for the 18 in. plow from 7 to 11.6. From these results the number of plows an engine of given horsepower can pull is computed, the results being said to check with actual practice. In addition the average total drafts and drafts per square inch for 12 to 17 in. plows, plowing from 6.5 to 8.5 in. deep in clay sod, are given, the drafts varying from 412 to 637 lbs.

The results as a whole indicate that the most important factors affecting the draft of plows are the depth and speed of plowing, the character, quality, and moisture content of the soil, the width and depth of furrow, the shape and finish of moldboard, and the quality of material entering into its construction.

[Economic necessity of mechanical power for deep plowing], P. S. Rose (*Amer. Thresherman, 15 (1913), No. 10, pp. 3–5, figs. 2*).—Considerable data derived from agronomists from 36 agricultural colleges on the whole show a need of somewhat deeper plowing to obtain the best crop yields. Data from the same sources on the average annual cost of maintaining a first-class draft horse, together with the results of draft tests of 14 and 16 in. plows, plowing furrows from 4 to 8 in. deep, indicate that on the basis of a horse's being able to exert a pull equal to one-eighth his weight continuously for 8 hours a day at 2½ miles per hour fully 70 per cent more power is required to double the depth of plowing, at least 50 per cent more work animals are required, and the cost of their maintenance makes necessary the more extended use of mechanical power.

Efficiency of motor trucks with trailers, M. Cilley (*Engin. Rec., 67 (1913), No. 5, pp. 120–124, figs. 13*).—This article reports an investigation of the relative economies of team wagon outfits, motor truck outfits alone, and motor truck trains, consisting of 3 to 6 trailers, including tests made under various conditions from which are derived ton-mile cost curves and tables, showing the possible daily accomplishments of each kind of outfit for various hauls. In addition data and curves are given of dynamometer tests showing the draft per ton of various loads under various road conditions.

The tests in general demonstrate the ability of a 3-ton motor truck to maintain a sustained draft of over 3,000 lbs., and show that on ordinary roads at average speeds and on usual grades the draft required by 1 trailer with a 5-ton load ranges from 400 to 2,000 lbs., and for 2 trailers loaded with 5 tons each from 750 to 3,000 lbs., an average of from 50 to 200 lbs. per ton. This, together with the increased delivery and the remarkable economy as shown by the tonnage delivery tables and by a comparison of the costs per ton mile, indicate that the motor truck with from 3 to 6 trailers more nearly solves the problem of highway transportation than anything heretofore.

The utilization of exhaust steam for heating boiler feed water and wash water in milk plants, creameries, and dairies, J. T. Bowen (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 209, pp. 13, figs. 3*).—It is stated that in the average dairy steam power plant, using 40 lbs. of steam per horsepower hour, 84.5 per cent of the heat in the steam is still available in the exhaust. A tabulated estimate indicates that for every 10° F. the feed water is heated before entering the boiler, approximately 1 per cent less fuel is required to generate the same amount of steam and the boiler capacity is increased approximately 1 per cent. In addition the injurious effects of unequal expansion in the boiler due to feeding cold water are diminished, constant boiler pressure is more easily maintained, and constant firing is made possible.

A diagrammatic plan of a dairy plant is given in which the heat in the exhaust steam is utilized in heating the boiler feed water, wash water, etc. It is stated that a well-designed plant of this nature is capable of converting approximately 4 per cent of the heat value of the fuel into mechanical energy

and 6.2 per cent of the total heat in the steam. With a 25 h. p. engine, using 40 lbs. of steam per horsepower hour, it is estimated that the exhaust steam from the engine is capable of heating a total quantity of 6,000 lbs. of feed water per hour from an initial temperature of 60° F. to a final temperature of 200°. The total saving in fuel in a plant equipped with a 40 h. p. boiler, having a furnace and boiler efficiency of 50 per cent, is estimated at 419.95 lbs. per day, which with coal at $4 per ton will pay for the water heating equipment in 13 months if the plant is operated 8 hours per day 310 days in the year.

Directions are given for the proper operation of steam and water pumps and injectors.

The utilization of the exhaust steam still remaining in heating the building, skim milk, starter, etc., is to be considered in a later circular.

An experimental study of heat transmission and entrainment in a vacuum evaporator, E. W. KERR and A. J. ISACKS (*Louisiana Stas. Bul. 138, pp. 72, pl. 1, figs. 16*).—In this bulletin a summary of the principles involved in the evaporation of liquids in vacuum is followed by the methods and results of experiments made for the purpose of obtaining accurate data relative to the general subject of evaporation of sugar juice, with especial regard to heat transmission and secondarily to entrainment.

The apparatus used was of such type that all conditions could be thoroughly controlled and one condition could be varied, all others being kept constant, thus allowing one variable to be kept isolated and studied. A single evaporation effect was used in the experiments but it was so arranged that both the steam pressure supplied and the vacuum in the vapor space could be thoroughly controlled and made any desired amount.

The experiments yielded the following results: With both 1¾ in. by 24 in. and 2 in. by 48 in. tubes the maximum evaporating capacity was obtained when the level of the juice in the gage glass was maintained at about one-fourth to one-third the length of the tubes above the lower tube plate, and it was found that either higher or lower levels than between these gave a lower capacity. With a given temperature fall a greater transmission of heat resulted with high steam pressure than with low steam pressure in the calandria. The steam temperature in the calandria was often found to be lower than that corresponding to saturated steam at the given pressure and the temperature also varied in different portions of the calandria, both of which were attributed to the presence of air with the steam. The coefficient of heat transmission was always greater with high than with low steam densities and was found to decrease in direct proportion with the increase of the juice density. Superheated and saturated steam under like conditions gave the same coefficient of heat transmission. The net increase in evaporative capacity of the downtake calandria over that without a downtake was found to be 19 per cent. Tubes 1¾ in. by 24 in. and 2 in. by 48 in., all things considered, yielded equally good results.

Entrainment was found to vary mainly with the heat of water evaporated per square foot of heating surface per hour, with the height of boiling, and with the dimensions of heating tubes.

Small water supplies, F. N. TAYLOR (*London [1911], pp. VIII+174, figs. 118, pls. 5*).—This is a practical treatise on the methods of collecting, storing, and conveying water for domestic use in large country mansions, small villages, and farms. It contains chapters on properties of water and sources of supply, wells and well sinking, flow of water in channels and pipes, pumping water, storage and distribution, and an index on noises in water pipes and their causes.

A brief discussion is given of the impurities in water, pollution of rivers, and the dangers in wells, and simple methods of testing water supplies to detect contamination are described. It is stated that for domestic supply river

water should never be used if a well supply is available, and that a marked distinction should be made between drinking water and water for general household use. Some geological and other facts are given which should aid in the location of wells and other sources of supply so as to obtain clean, pure water, and the sinking and lining of shallow and deep wells through various materials are discussed in detail.

The two final chapters give a large amount of practical information and data relative to the proper selection, installation, and operation of pumping and power machinery for small plants, and the general design and construction of storage and distribution systems, including plain and reenforced concrete dams, reservoirs, and conduits, and steel and wood stave pipe lines.

RURAL ECONOMICS.

[Work in rural economics] (*Wisconsin Sta. Bul. 228, pp. 44–47, figs. 2*).—A limited outline of work undertaken by H. C. Taylor, D. H. Otis, and C. J. Galpin is given.

Data concerning the amount and distribution of capital, the amount and sources of farm income, and the expenses on 80 dairy farms have been gathered and tabulated. On 39 of these farms the net profit is shown to have been greatest where the investment in operating capital was from 20 to 33 per cent of the total capital.

The economics of crop disposal, C. S. SCOFIELD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 118, pp. 3–10*).—This is one of a series of lectures read before the scientific staff of the Bureau of Plant Industry, in which the author discusses briefly the economic disposal of crops. He divides the subject into the following heads: Need of uniform distribution, better means of distribution, knowledge of crop conditions, certification of crops, scope of investigations, and community cooperation.

"The particular plea that I wish to make is that as a group of men working together upon allied subjects we ought to give a large proportion of our thoughts to the economic phases of the industries upon which we are at work."

How to market farm products for profit, G. SLOCUM (*Detroit, Mich., 1912, pp. 64, pl. 1*).—In addition to a discussion of systems of marketing and practices frequently followed by farmers the author makes a number of suggestions as to the preparation, grading, packing, and shipping of farm products, pointing out the relation between superior market condition and the highest market price.

Producer closer to consumer, M. FLOYD (*Rural New Yorker, 72 (1913), No. 4198, p. 534*).—This article illustrates how an agricultural college may aid the producer to dispose of his crop directly to the consumer by showing what has been done by the Kansas College in aiding the farmers of Kansas to dispose of their corn, hay, and apples for the last year or so. It is noted that 350 carloads of apples were sold through the college exchange during the first year.

Marketing fruits at the Farnsworth farms, W. E. YOUNG (*Agr. Student, 19 (1913), No. 7, pp. 489–492, fig. 1*).—This article describes the methods of packing and marketing fruits at a leading fruit farm in Ohio. It is claimed that much better prices were secured than by neighboring growers who had no definite plan for handling and marketing their fruit.

Cooperative live stock marketing, W. H. TOMHAVE (*Nat. Stockman and Farmer, 37 (1913), No. 3, pp. 68–70*).—This is a paper read at the first National Conference on Marketing and Farm Credits, held at Chicago, April 8–10, in which the author discusses the cooperative method of shipping live

stock, illustrating the advantage of such a system by showing the plan, work, and success of the local association at Litchfield, Minn.

This association was organized in 1908 and marketed 14 carloads of stock that year, receiving a gross income of $11,600. During 1910 the members shipped 81 carloads, for which they received $102,163; and in 1912, 146 carloads, with gross returns of $181,545. Where less than 100 farmers sold stock through the association in 1908 there were more than 700 in 1912. "In 1908 there were 6 local dealers located at Litchfield, all of whom were supported by the farmers of that locality. Today the Farmers' Cooperative Association is the only live stock shipper at that place."

It is stated that the cooperative system meant to the live stock shippers of the locality a saving from of $8,000 to $10,000 last year. Since this association began work 5 years ago more than 40 such societies have been organized within the State.

It is noted that the movement has not only been of benefit in a financial way, but has resulted in the production of an improved quality of stock, opened up larger markets, and developed better business methods in all other farm operations.

Cooperation in Wisconsin, R. A. CAMPBELL (*Amer. Rev. of Reviews, 47 (1913), No. 4, pp. 464–470, fig. 1*).—A summary of the history and growth of the cooperative movement in Wisconsin is here presented, concrete examples being given to show the various lines of operation and just what has been accomplished. The business side of the movement is illustrated by the success of the cooperative stores; cooperative gardening and marketing associations; butter and cheese factories; cooperative grain elevators, potato and tobacco warehouses; cow testing associations; and mutual telephone and insurance companies.

Of 3,000 creameries and cheese factories in 1912 at least 600 were cooperative. Since the organization of cow testing associations 6 years ago about 1,500 dairymen have held membership, and 17,500 cows have completed a year's record. In 1900 there were 189 mutual insurance companies in the State and the amount of property insured was valued at $191,000,000, while in 1912 the number of companies had increased to 205 and the value of property insured to $404,000,000.

A map is given showing the number of unions and members of the American Society of Equity in 1911 by counties.

The cooperative movement in the United Kingdom, DE COPPET (*Raps. Com. Agents Diplo. et Cons. France, 1912, No. 1017, pp. 27*).—This report reviews the work and progress of cooperative organizations in the United Kingdom for the period 1899–1909, dividing the organizations into 4 classes, viz, industrial, agricultural, banking and insurance, and construction. The cooperative industrial societies are divided into workers' and consumers' associations, and the latter divided further into wholesale and retail societies. The number of retail societies is reported to have decreased from 1,446 in 1899 to 1,430 in 1909, while the membership increased from 1,613,461 to 2,469,396. Cooperative agricultural societies are divided into buying and selling organizations, production societies, and organizations for acquiring small farms. Subdivisions are made in the other classes of organizations, and notes and data are given showing the number, membership, etc., of each for a period of years.

Agricultural labor situation in the United States, F. F. MATENAERS (*Deut. Landw. Presse, 40 (1913), No. 26, p. 318*).—This article presents a summary of Bureau of Statistics Bulletin 94 previously noted (E. S. R., 28, p. 87).

A method of determining the average length of life of farm equipment, W. J. SPILLMAN (*Science, n. ser., 36 (1912), No. 930, pp. 565–568*).—The author

describes a method by which he would determine the rate of depreciation or the average length of service of a farm implement or any animate or inanimate piece of property. To illustrate the method he takes cases in which the number of objects is approximately constant from year to year. Thus, for farm dwellings, he proposes the following hypothesis: Let N_1 represent the number of dwellings in their first year of life; N_2 the number in their second year; N_3 the number in their third year, and so on, N_n representing the number of dwellings of the oldest age represented in the group. Dividing then the total number of dwellings of all ages in the group by the average number in their first year the quotient will be the average length of life that those now in their first year will live, or

$$L = \frac{N_1 + N_2 + N_3 + \ldots + N_n}{N_1}$$

Similar formulas are given for determining the average length of life of any item that remains constant from year to year.

Foreign crops, February, 1913, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statis. Circ. 46, pp. 20*).—Notes and tables are presented in this circular showing area, production, exports, and prices of wheat, flax-seed, and oats in Argentina in 1907–8 to 1912–13; area of corn in Argentina by Provinces, 1910–1913; area harvested and production of specified crops in Canada, 1911–12, by Provinces; imports of wheat, wheat flour, corn, oats, and barley into the United Kingdom, 1908–1912; area sown to winter wheat in France by regions, 1908–1913, and to winter rye, barley, and oats, 1912–13; production of apples, etc., stone fruits, nuts, figs, and prunes in Italy by Provinces in 1912; area and production of specified crops in Spain and Austria, 1910–1912; production of specified crops in Norway and Sweden for a period of years; area, production, imports, and exports of tobacco in Germany, 1902–1912; and imports of wheat, wheat flour, and corn into Germany by countries of origin, 1907–1912.

AGRICULTURAL EDUCATION.

Report of the [Indiana] Commission on Industrial and Agricultural Education (*Rpt. Com. Indus. and Agr. Ed. [Ind.] 1912, pp. 133*).—A report of this commission, an account of which has been previously noted (E. S. R., 28, p. 497).

Among its other conclusions it recommends that state aid equal in amount to two-thirds the sum expended in instruction in vocational, technical, and such other related subjects as are necessary to complete well-rounded courses in approved industrial, domestic science, and agricultural schools or departments be given to the local authorities. The vocational work is for pupils above 14 years of age, and the courses to be of less than college grade.

It is further recommended that all teachers of elementary agriculture, domestic science, or industrial work in schools other than those approved by the state board and securing state aid, be required to pass an examination in such subjects by the beginning of the school year 1915; that an expert from Purdue University be also employed as an agent of the state superintendent of public instruction; and that counties may provide county agents for the purpose of advancing agriculture, domestic science and industrial work, the salaries being met in part from county and in part by state funds, and the appointment being made by Purdue University with the approval of the county board of education and the state board of education. This county agent would cooperate with farmers' institutes, farmers' clubs, and other agricultural organizations, conduct practical farm demonstrations, boys' and girls' clubs and contest work, and other movements for the betterment of country life, and on the request of

the county superintendent give aid and advice to the superintendent or teachers of the county in agricultural instruction.

Training courses for rural teachers, A. C. MONAHAN and R. H. WRIGHT (*U. S. Bur. Ed. Bul., 1913, No. 2, pp. 61*).—According to this bulletin, not more than one in every five school teachers in the United States is professionally trained to the extent of being a graduate of a teachers' training course. Three main agencies are attempting to meet the demand for trained rural teachers, viz, the normal school, the county training school, and the high school. The authors describe the work of each of these agencies and select typical examples from different sections of the country for more detailed description.

Teaching agriculture in rural and graded schools: A correlation scheme with suggestive lessons on the topic "corn", E. C. BISHOP, R. K. FARRAR, M. H. HOFFMAN, and MAMIE G. CUNNINGHAM (*Iowa State Col. Agr. Ext. Dept., School Circ. 1, 1912, pp. 47, figs. 5*).—The course herein outlined makes provision for a full year's work for the seventh and eighth grades. It includes, among other things, correlation "corn" studies by months with supplementary work, suggestions for class work in a corn field, practical home work, a list of materials for instruction purposes, and suggestions on making agricultural booklets.

Six hundred thirty-eight questions on agriculture, A. F. FRANTZ (*Boston [1913], pp. 160*).—Although the author has followed in a general way the text-books on agriculture by Fisher, Hill, and Wilkinson, the questions are adapted to any text-book on the subject.

Plant and animal children, how they grow, ELLEN TORELLE (*Boston, New York, and Chicago [1912], pp. IV+230, figs. 335*).—This book attempts to express in simple language the essential facts and principles of growth and development in plant and animal life and to show the relation of these facts and principles to human life. It is written especially for children.

Rain, J. W. SMITH (*Agr. Col. Ext. Bul. [Ohio State Univ.], 8 (1912), No. 3, pp. 16, figs. 16*).—An elementary discussion of the subject.

Question summary to accompany Soil Fertility and Permanent Agriculture, C. G. HOPKINS (*Boston, New York, Chicago, and London [1912], pp. IV+21*).—These questions are intended to help the student to use the author's text-book entitled Soil Fertility and Permanent Agriculture (E. S. R., 23, p. 17).

Buying nursery stock, W. PADDOCK (*Agr. Col. [Ohio State Univ.], Farmers' Reading Course, 1 (1912), No. 1, pp. 10, figs. 5*).—Essential directions are given for buying nursery stock of the more common orchard fruits.

Correlating tree study with other kindergarten and primary grade subjects, EDITH R. MOSHER (*Nature-Study Rev., 9 (1913), No. 2, pp. 54–60, figs. 3*).—An attempt to point out some ways in which the study of trees may be introduced into the nature study work in the primary grades without excessive demands on the instructor's time, by correlating the exercises with the work in language and drawing. Some definite suggestions as to how this may be done are given and the value of the study of the trees as a recreation lesson is discussed.

Tree planting on public school grounds.—The farm woodlot, E. SECREST (*Ohio Sta. Circ. 130, pp. 15–17*).—This circular contains an announcement of the plans under which the Ohio Station is prepared to distribute seedling trees to high schools and centralized schools for planting on school grounds, and also of the assistance it can give to woodlot owners in the examination of woodlots with a view to making suggestions as to their management.

Manual for the North American bird and nature study, H. B. SHINN and G. A. ABBOTT (*Chicago [1912], pp. 459*).—In addition to special descriptions of birds, minerals, plants, insects, fishes, and mammals, this manual contains

chapters on various factors of animal life such as parasitic and social habits, color, modes of defense, and the relation between the teeth, the diet, and the disposition.

First principles of feeding farm animals, C. W. BURKETT (*New York and London, 1912, pp. XVI+336, pl. 1, figs. 135*).—A practical treatise on the feeding of farm animals, discussing the fundamental principles and reviewing approved practices of feeding for largest returns. The needs of the teacher of animal feeding have been kept in mind at every step, and the object seems to have been to set forth the several phases in pedagogical as well as utilitarian form.

High school sciences, apparatus, and reference books (*Bul. Missouri State Normal School, Fourth Dist., 6 (1912), No. 4, pp. 32, figs. 13*).—Five high school units of science including agriculture are outlined, together with suggestive lists of apparatus and reference books for each subject.

The Bureau of Plant Industry, its functions and efficiency, B. T. GALLOWAY (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 117, pp. 3–12*).—This is a lecture delivered February 28, 1913, before the scientific staff of the Bureau, and discusses briefly some of the activities of the Bureau and "some of the directions of its future functions and the basis for the efficiency of these functions."

The author considers the three main functions to be those of research, experimentation, and demonstration. In his opinion, the demonstration work to be most effective "must be coordinated with the extension service of the colleges in the respective States wherever this is practicable," for the reason that the state institutions "are, or should be, closer to the people on local questions than we are."

The relation of agricultural extension agencies to farm practices, C. B. SMITH and H. K. ATWOOD (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 117, pp. 13–25, fig. 1*).—With a view to obtaining data as to the relative efficiency of the various agricultural extension agencies in actually reaching the man on the farm and influencing his practice, 4 men were sent out over routes varying from 400 to 700 miles in different sections of the country to inquire of each farmer living along the roads passed over as to the assistance which he had obtained from the publications of the experiment stations and this Department, farmers' institutes, agricultural organizations, farm papers and books, and demonstration agents.

The data obtained are summarized as follows:

"Of the 3,698 farmers personally interviewed in this survey, about 1 farmer in every 1.5 visited takes a farm paper, 1 in 2.3 receives agricultural bulletins, 1 in 3.3 attends farmers' institutes, 1 in 6.5 belongs to some agricultural organization, 1 in 14.5 writes to agricultural institutions for advice, 1 in 23.8 has a few farm books, 1 in 11 gets personal instruction from county demonstration agents in the South, and 1 in 159 gets personal instruction in the North and West. One farmer in every 2.3 stated that none of the above agencies was helpful in his farming.

"Of the farmers receiving bulletins, 48 per cent put into practice something learned from them, 54 per cent of those attending institutes put into practice suggestions made there, while 79 per cent of those receiving instruction from demonstration agents in the South put into practice the instructions given.

"The replies from 469 farmers who received agricultural bulletins, attended farmers' institutes, and took farm papers indicate that 21 per cent of this number favor the bulletins as the most helpful source of information on farming, 14 per cent favor the farmers' institute, while 66 per cent favor the farm papers.

"In the case of the 62 farmers who received instruction from county agricultural agents, took farm papers, and received bulletins, practically 11 per

cent favored the bulletins, 24 per cent favored the demonstration agents, while 52 per cent favored the farm papers. So far as this survey is an indication, the agricultural press would seem to be at present the most efficient of our agricultural extension agencies in reaching the farmer."

Agricultural extension service (*Wisconsin Sta. Bul. 228, pp. 48–76, figs. 14*).—The service is divided into (1) the departmental activities which are mainly demonstrational in character and are carried on so far as possible under field conditions, (2) the county agricultural representative system, in which representatives of the college are located in the several counties to carry on field extension work, (3) the collective work, including the simultaneous services of several departments given through the medium of extension courses and schools held mainly in the winter.

The county agricultural representative is a new feature of the extension work. In addition to the direct aid which this representative is to give the farmers, mainly during the summer months, he also has charge of the agricultural instruction in the county training school for the training of rural teachers. He will during the winter season organize and help to conduct short courses in agriculture for farm boys who have left the country school, as well as farmers' courses in connection with the agricultural extension service of the university.

Southern Railway farm improvement work (*Tradesman, 69 (1913), No. 10, p. 46*).—This notes that successful results are being obtained from the work of field agents of the agricultural department of the railroad in cooperation with the state and federal departments of agriculture and the various agricultural colleges, in improving agricultural conditions along its lines.

Potato growing clubs (*California Sta. Circ. 83, pp. 4*).—This circular is intended to furnish instructions on potato growing for the boys' and girls' club contests in California. A suggestive score card for potato growing contests and directions for keeping notebooks on how the crop was grown are given.

MISCELLANEOUS.

Twenty-third Annual Report of New Mexico Station, 1912 (*New Mexico Sta. Rpt. 1912, pp. 37*).—This contains the organization list, a report of the director on the work, publications, and exchanges of the station, including reports of heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1912.

Twenty-fifth Annual Report of New York Cornell Station, 1912 (*New York Cornell Sta. Rpt. 1912, pp. CCVII+738, pls. 43, figs. 203*).—This contains the organization list, reports of the director of the station and heads of departments, a synopsis of the courses of instruction offered in the college of agriculture, a financial statement for the federal funds for the fiscal year ended June 30, 1912, and for the state funds for the fiscal year ended September 30, 1912, and reprints of Bulletins 304–320 and of Circular 12 previously noted.

Report of the director, 1912, H. L. Russell (*Wisconsin Sta. Bul. 228, pp. 91, figs. 38*).—This contains the organization list, a report of the work of the station during the year, portions of which are abstracted elsewhere in this issue, brief summaries of the publications of the year, and a financial statement for the federal funds for the fiscal year ended June 30, 1912.

Monthly Bulletin of the Department Library, January and February, 1913 (*U. S. Dept. Agr., Library Mo. Bul., 4 (1913), Nos. 1, pp. 3–33; 2, pp. 37–63*).—These numbers contain data for January and February, 1913, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES.

Arizona University and Station.—The first state legislature has granted appropriations for the ensuing biennium aggregating $299,800. Of this $165,000 is for an agricultural building and $23,500 for agricultural instruction. The remainder, $111,300, is for maintenance and improvements for the station, and includes $30,000 for a new station farm in the Salt River valley.

Kansas College and Station.—W. M. Jardine, acting dean and director, has been appointed dean of agriculture and director of the station. L. E. Call has been appointed professor of agronomy.

A cattle feeders' day was held at the college May 2, with an attendance of over 500 cattle feeders and representatives from several stock yards. It is proposed to make this an annual event with a view to bringing the cattle men of the State into closer cooperation with the animal husbandry department.

Louisiana Stations.—Cooperative dairy extension work has been begun with the Bureau of Animal Industry of this Department, under the direction of C. H. Staples, who has been in charge of the station dairy for several years.

Michigan College and Station.—The legislature has increased the resources of the college by changing the one-tenth mill tax to a one-sixth mill tax. On the basis of the present year's valuation this would provide $380,000 per annum. The legislature also authorized the purchase of land adjacent to the college farm.

Nevada University and Station.—Gordon H. True, professor of agriculture and animal husbandry in the university and director of the station, has resigned to become professor of animal industries in the University of California July 1, vice F. R. Marshall.

New Hampshire College.—The inauguration of Dr. E. Fairchild as president took place May 21, with over one thousand guests in attendance, including representatives from practically all educational institutions in New England. The principal address was by President W. O. Thompson, of Ohio State University, on the duties and responsibilities of colleges of agriculture and mechanic arts.

Pennsylvania College.—F. S. Putney, formerly connected with the Institute of Animal Nutrition but at present professor of animal husbandry in the Rhode Island College, has been appointed assistant professor of dairy husbandry and will enter upon his new duties July 1.

Washington College and Station.—An act of the last legislature establishes a bureau of farm development, consisting of the director of the station and the boards of county commissioners of all counties of the State. The director of the station is made director of the new bureau and upon application from the county commissioners is authorized to appoint and assign to the county an agricultural expert. The commissioners may reject any appointment and are authorized to determine the period for which the expert shall be employed and to fix the compensation at a rate not to exceed $200 per month.

The legislature also established a state department of agriculture under the direction of a commissioner of agriculture, who will take over duties now divided among a large number of officials. Among these are the stallion registration work now carried on by the college, and the inspection of feeding stuffs and fertilizers now performed by the station.

Elton Fulmer has been appointed acting director of the station.

ADDITIONAL COPIES of this publication may be procured from the SUPERINTENDENT OF DOCUMENTS, Government Printing Office, Washington, D. C., at 15 cents per copy; subscription price, per volume, : : : $1

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